TRAFFIC QUARTERLY

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JULY 1954

Responsible Drivers
Highway Needs in Virginia
Enforcing Law on Slow Driving
Transportation Planning in Houston
African Town Prevents Traffic Problems
Parking: Some Retrospective Views
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Baltimore's Teen-Age Court
Seattle's Freeway System
Organizing for Safety
Buffalo Parking

THE ENO FOUNDATION FOR HIGHWAY TRAFFIC CONTROL

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Driver Responsibility

TODAY traffic is a good example of permitting a problem to thrive through a system of growing without guidance. Through science and other phenomenal means, we have progressively extended ourselves to assure national progress and growth. In the abundance of our accomplishment we have grossly neglected traffic.

From the beginning, and throughout its mounting importance, transportation has faced competition, legal controls and other obstacles, but the determined builders were never dismayed. The problems of those pioneers are not the problems that confront us.

"Journey" has a different meaning, no longer a day's travel of twenty miles. The motor car with its perennial improvements has rapidly changed the travel picture, more than one could have anticipated a generation ago. Sadly, it has displaced the horse. Modern transportation brought with it a high degree of flexibility that fully meets the need and the whim of every individual. With its convenience and natural wide use, it brought other problems. It entered so promptly and so deeply into our daily regimes that its sudden absence would wreak serious changes.

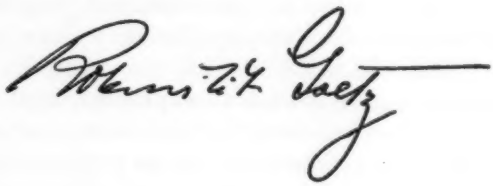
It focused attention on the great need for new and improved roads, resulting in a mode of travel and personal association unknown in any other part of the world. Though quickly aware of its advantages, we have misused them. No other statistical national record offers so little of which to be proud, or so much of conscious guilt.

Our limited determination to improve its use has been characterized by spasmodic ineffectual efforts. These consist of speed limits, signs, lanes, lights and superfluous others. They are intended as aids to the driver of whom too many offensively ignore them. Frequently they are promiscuously placed, obscured, illegible and of sufficient variance to be frustrating.

We have long recognized that relatively the driver is more important than the car. We strive to learn more about his attitude. But whatever his attitude or whatever offense, he in most cases is the culprit.

On the record, we have been dilly-dallying. The irresponsible part of the driving public is unimpressed and grows. We have had time and reason to recognize that safety can come only from safe driving.

Let's become severely simple but determined, and put adequate responsibility on all drivers.



Highway Needs in Virginia

RUDYARD B. GOODE AND ROBERT K. TURNER, JR.

Mr. Goode and Mr. Turner are associated with the Virginia Council of Highway Investigation and Research, a cooperative organization sponsored jointly by the Virginia Department of Highways and the University of Virginia. Mr. Goode is in charge of the Council's Economic Studies Section and Mr. Turner of the Report Section.

A GREAT deal of information on highway problems has been presented to the public during the last few years. Transportation-minded Americans have rejoiced to see a growing number of their fellow citizens become conscious of the severe difficulties that have plagued highway administrators since the end of World War II. Within the highway transportation field, special interest groups have stopped clawing at one another long enough to offer united support to the effort of making the taxpayer aware of what is happening to his roads now and what the future promises.

The result has created in many localities an interest in highway problems comparable to that stimulated by the Better Roads Movement of a generation ago, and with it a willingness to pay for highway improvements so vitally needed. This is not to say that most Americans regard the highway problem with a burning intensity, but rather that a quiet and healthy desire for improved roads has been encouraged and is now flourishing in some degree.

Although the highway problem is recognized to be national in scope, most people, because of their dislike of "government interference," think of the solution in terms of a large series of local improvements. Just as the extent of highway needs varies from state to state, so the approach to their remedy varies. A number of states have launched improvement programs designed to relieve the worst present burdens and to provide for the impact of future traffic volumes on their systems.

Virginia was one of the first states in the nation to inaugurate such a post-war program. In 1944 the General Assembly directed the

department of highways to prepare a plan which would insure the provision of a system capable of meeting the demands of traffic years in the future. In 1945 the necessary study was completed. In 1946 the Assembly approved the measures proposed and put teeth into them by voting a one cent per gallon increase in the fuel tax. Because of existing needs, a substantial part of the additional revenue from the tax increase was allotted to the state's secondary system. Nevertheless, with funds provided, the improvement program was underway. The proposed measures were based on sound predictions of future conditions as far as anyone could tell at that time. Virginians, hearing citizens of other states bewail a lack of progress, had every reason to feel self-satisfied.

1945 Study Out-dated by 1953

Such complacency, if it ever existed, was short-lived. The makers of the "Twenty Year Plan," the product of the 1945 study, had made good, conservative estimates of the factors that would affect highway use during the program period. But no one could have foreseen the phenomenal upsurge in road use that Virginia experienced from 1945 to 1953. The estimates were quickly outrun. The twenty-year-plan predicted a population of 3.2 millions in 1965, but by 1950 the state had 3.3 millions. It was estimated that persons per registered motor vehicle would decrease from 4.7 in 1944 to 4.2 in 1965, but by 1953 the ratio of 3.0 had been reached.

It was thought that the registration of motor vehicles would increase from 567,000 in 1944 to 748,000 in 1965, but by 1953 Virginia had 1,117,000 vehicles registered. But the most damaging assumption was that the price of materials and labor would descend from the war-time peak and stabilize at a level somewhat, but not greatly, higher than pre-war. The sharp bite of inflation into the purchasing power of the highway dollar was not, indeed could not have been, anticipated.

Instead of gaining on its highway needs, Virginia began to lose ground almost as soon as its improvement program was begun. A 1951 study of how the highway system could continue to operate under emergency conditions which the Korean war might impose

showed that $145,000,000 should be spent on Virginia's major roads during a ten-year period if an emergency program were introduced, but that $250,000,000 should be spent for a normal program of maintenance and improvement. This study was confined to 2,700 miles of the primary system, and the advancement of the 1945 program for the remaining 47,000 miles of primary and secondary roads and urban extensions was not considered. Even in a time when the possibility of another full-scale war was being considered and Virginia's highway administrators were getting ready to tighten their belts again, it was stated that "needs developed (in the study of 2,700 miles of the primary system) are indicative of the scope of the over-all road and street problem."

By 1953 it was obvious that relief measures were vitally necessary if Virginia were to keep abreast of the needs being generated by day-to-day increases in traffic volumes as well as to work on the backlog that remained unsatisfied. Current revenues obviously were insufficient. Nothing remained but to present the problem once again to the General Assembly, giving it a clear and ample picture of the program's lack of progress. So that an intelligent reevaluation of the problem as a whole could be made, the department of highways conducted another study of needs, in some respects more comprehensive than had ever been undertaken in Virginia. The new study was carried out cooperatively with the U. S. Bureau of Public Roads and supervised by the Division of Traffic and Planning of the Virginia Department of Highways. Forecasts were restricted to the twelve years from 1953 to 1965, the remaining portion of the original twenty-year planning period.

Needs for 12-Year Program Surveyed

In May 1953, resident engineers evaluated the 8,385-mile rural primary system. Each maintenance control section was compared with the design standards applicable to that class of highway. (For administrative purposes, roads in the rural primary system are assigned to one of four classes according to the amount or character of traffic they carry.) When a given section of highway failed to meet the prescribed standards for carrying current traffic, the deficiency was

noted and the required treatment or improvement was determined. This procedure provided the basis for establishing the present needs (backlog).

The adequacy of each section to carry future traffic was also appraised. If adequate at that time but inadequate for the larger volumes of traffic expected in later years, the inadequacy was noted, and corrective treatment was considered a future need. Costs were estimated by the location and design division for roadway improvements and the bridge division for structures. Prices of July 1953 were used.

Such an extensive mile-by-mile analysis was not practical for the 40,000-mile secondary system. (In Virginia, the secondary roads in 96 of the 100 counties are under state jurisdiction.) Standards for these roads are based solely on the volume of traffic served and are as follows:

1. Roads carrying 50 or more vehicles per day should be hard surfaced;
2. Roads carrying from 10 to 49 vehicles per day should have an all-weather surface;
3. Roads carrying from 0 to 9 vehicles per day should have a light surface; and
4. Unsurfaced roads should be eliminated.

Since traffic counts are taken continuously, the mileage with deficient surface types can be ascertained easily. These surfacing needs were considered as the backlog of secondary system needs. To supplement the inadequacies of surface, resident engineers made field inspections of the secondary mileage under their jurisdiction in the summer of 1953 and reported the structures, reconstruction, and new additions required for each of the next twelve years. Future surfacing needs were forecast using an expected annual traffic increase of 4.3 percent.

The Virginia Department of Highway lacks jurisdiction over the extensions of primary routes in cities and towns of 3,500 and over. Consequently, types of improvement selected to provide relief from congestion and other deficiencies must be determined by the municipalities. No new survey of urban highway and street needs was

undertaken for this study. However, recent and reliable data on most of the urban needs were provided by a 1951 study conducted by the Automotive Safety Foundation in co-operation with the department of highways and the Bureau of Public Roads. In addition to the rural routes covered by this study, about 223 miles of the 400-mile urban system were evaluated. The resulting estimates were adjusted and revised to include the previously excluded mileage, the effects of price changes, and work initiated since 1951. Such a procedure obviously gives a backlog figure. No estimate of future urban needs was attempted in view of local sovereignty in decisions affecting the solution of local problems.

What was established by these procedures? On the rural primary system, the following deficiencies existed:

1. 3,700 miles had one or more sharp curves per mile;
2. 5,300 miles had one or more places per mile with restricted sight distance;
3. 3,462 miles had pavements too narrow for present volumes of traffic;
4. 5,500 miles had narrow shoulders;
5. 492 miles had weak surfaces; and
6. 561 structures were inadequate in one or more features.

Some 2,884 miles and 561 structures were found to be so inadequate or substandard as of May 1, 1953, as to warrant immediate improvement. The total cost of eliminating this accumulated backlog of needed improvements was estimated at $282,246,000 using July 1953 prices. Table 1 shows the needs by type of improvement required.

Table I

PRIMARY SYSTEM IMPROVEMENTS NEEDED (May 1, 1953)

Type of Improvement	*Miles*	*Estimated Costs*
Roadways		
New Construction	481.5	$ 51,641,000
Reconstruction	2,277.1	189,153,000
Resurfacing	109.4	2,399,000
Widening	15.6	715,000
Subtotal Roadways	2,883.6	$243,908,000

Structures	*Number*	
New Construction	298	$ 23,323,000
Reconstruction	263	15,015,000
Subtotal Structures	561	$ 38,338,000
Total Costs		$282,246,000

The roadway costs can be further distributed as follows: For rights-of-way, $44,390,000; grading and draining, $70,276,000 and surfacing, $129,211,000.

Future traffic increases will create new needs. During the twelve-year period (1953–1965), some 4,575 miles and 626 structures will become inadequate in one or more features because of the higher volumes of traffic. These needs, of course, are in addition to the present backlog. The chief requirement during this period will be the providing of additional capacity, reflected in the fact that nearly 3,600 miles of the primary system will have to be reconstructed. The following table presents the future needs by type of improvement required.

Table II

FUTURE PRIMARY SYSTEM IMPROVEMENTS NEEDED (1953–1965)

Type of Improvement	*Miles*	*Estimated Costs*
Roadways		
New Construction	278.0	$ 27,339,000
Reconstruction	3,577.1	251,320,000
Resurfacing	560.5	10,674,000
Widening	159.3	8,931,000
Subtotal Roadways	4,574.9	$298,264,000
Structures	*Number*	
New Construction	110	$ 13,703,000
Reconstruction	516	24,072,000
Subtotal Structures	626	37,775,000
Total Costs		$336,039,000

Of the $298,264,000 for roadways, $49,901,000 would be needed for rights-of-way, $81,711,000 for grading and draining, and $166,652,000 for surfacing.

The combined backlog and future primary system needs would require the expenditure of about $618,000,000 for their removal. To complete the picture, it should be added that nearly $150,000,000 is estimated as necessary for maintenance and replacements for the twelve-year period. Thus the funds needed for the rural primary system from 1953 to 1965 total about $768,000,000

If the standards set forth above are used, tabulations of the secondary system mileage by surface types and traffic volumes for the 1952–53 fiscal year show that surfaces should be improved on more than 15,000 miles of local roads. The surfacing improvements needed on the secondary system at the close of the 1952–53 fiscal year (June 30, 1953) were as follows:

Table III

SECONDARY SYSTEM SURFACING IMPROVEMENTS NEEDED

(June 30, 1953)

Miles which should be hard-surfaced:	Present Surface
2,755	All-weather
1,264	Light
59	Unsurfaced
Miles which should be all-weather surfaced:	
7,955	Light
1,010	Unsurfaced
Miles which should be light surfaced:	
2,083	Unsurfaced
Total mileage needing surface improvement:	
15,126 miles.	

The total cost of these surface improvements was estimated at $90,093,000 of which about 60 percent would be needed to provide an all-weather surface on 7,955 miles of presently light-surfaced roads. No classification of needed structures, reconstruction, and additions into present and future categories was attempted. Instead, all

of these items were placed in the future needs category. However, it is only reasonable to assume that substantial portions of the improvements are needed now. Future construction (surfacing) needs were estimated using the assumed traffic increase of 4.3 percent per year. The future secondary system needs are set forth in the following table.

Table IV

FUTURE SECONDARY SYSTEM NEEDS (1953–1965)

Type of needs	*Estimated Costs*
Construction	$ 37,905,000
Maintenance	203,851,000
Reconstruction	64,104,000
Additions	18,012,000
Structures	53,184,000
Total	$377,056,000*

* Total does not check because of rounding.

Total secondary system needs have an estimated cost of $467,956,000 of which $90,903,000 is for the backlog of surface improvements, $173,205,000 for the various future improvements, and the remainder, over $203,000,000, for maintenance.

It was noted above that the backlog of urban improvements was estimated by adjusting data obtained by a 1951 study. This method provided a minimum estimate of $138,997,000 as the amount required for the elimination of deficiencies existing on June 30, 1953, in cities and towns of 3,500 and over. Most of the needed urban facilities would provide added capacity. Because of the cities' sovereignty in street matters and the many uncertainties pertinent to local street problems, no attempt was made to estimate future urban needs.

Summary of Needs

The recent study of Virginia's highway needs shows that the following needs existed in 1953.

(1) The primary system (8,385 miles) includes 2,884 miles of highway and 561 structures deficient in one or more respects and in need of immediate improvement if present traffic is to be served with

speed, safety, and economy. Effecting these needed improvements would cost over $282,000,000 at July 1953 prices.

(2) Over 15,000 miles of the 40,000 mile secondary system need higher type surfaces. This work would cost over $90,000,000.

(3) In the cities and towns of 3,500 and over, the expenditure of at least $139,000,000 would be required to handle 1953 traffic efficiently.

Removal of the backlog of needs carries a price tag of about $512,000,000.

Over the twelve-year period, 1953–1965, the following new needs are expected to occur on the primary and secondary systems:

(1) Some 4,575 miles of highway and 626 structures on the primary system will require improvement estimated to cost $336,000,000.

(2) On the secondary system, higher type surfaces will be needed on more than 8,500 miles; over 9,100 miles should be reconstructed; 3,750 miles should be added to the system; 676 new structures will be required, and over 4,600 existing structures will need reconstruction. The cost of making these improvements should be about $173,000,000.

(3) Maintenance of the primary system will require about $150,000,000 and the secondary system nearly $204,000,000.

Total estimated costs of removing the backlog of needs, providing for necessary maintenance and replacements, and fulfilling future needs as they occur are:

(1) $768,000,000 for the primary system and
(2) $467,956,000 for the secondary system.

To these must be added the urban backlog of $138,997,000. The sum is $1,375,166,000.

A complete picture of Virginia's highway situation requires the estimation of future revenues. Only by noting the conditions expected in the future can a warrant be obtained for action aimed at solving the current problem. Accordingly, estimates of the revenue anticipated from each major source were prepared.

To estimate the revenue from each highway user impost, recourse was taken to the basic factors governing vehicle ownership

and highway use: population, persons per vehicle, and average use of each vehicle.

Virginia's population was nearly 3,319,000 in 1950. Now the population is estimated at about 3,525,000 and increases to 3,834,000 in 1960 and 4,083,000 by 1965 are expected. The persons-per-vehicle figure declined from 5.1 in 1940 to about 3.4 in 1950. A further decrease to about 2.7 by 1960 and 2.6 by 1965 is expected. In the period from 1952 to 1965, average vehicle use is expected to increase about 30 percent. When this estimate is combined with anticipated registrations, the result is a forecast of 1965 travel which is about 70 percent above 1952.

Using the forecast population and person-per-vehicle ratio, total vehicle registrations are expected to increase steadily from about 1,120,000 in 1953 to 1,570,000 by 1965. Assuming (1) no change in the present license and registration fee schedule, and (2) a slightly increasing proportion of heavier vehicles, license and registration fee revenues should increase from about $15,000,000 in 1952–53 to about $21,350,000 in 1964–65.

A combination of the estimates of registrations and average use per vehicle, shows that the fuel tax yield, after refunds, should increase from about $57,000,000 in 1952–53 to $83,400,000 for the 1964–65 fiscal year. This estimate is based on the continuation of the six-cent per gallon levy which has been in effect since 1946. The income derived from the 2 percent gross receipts levy on certain motor carriers is expected to increase from less than $1,500,000 in 1952–53 to $2,800,000 in fiscal 1964–65. Other imposts (chauffeurs' and operators' license fees, title registration fees, tolls and miscellaneous levies) are estimated to provide more than a million dollars each year. A summary of these estimates shows that the funds obtained by state-imposed levies will increase from about $74,000,000 in 1952–53 to over $109,000,000 in 1964–65.

To this state-produced income, federal grants must be added. At the time the study was prepared, the future of the various federal aid programs was in doubt, and no attempt was made to predict congressional action. Instead, since it seemed unlikely that the federal aid programs would be discontinued completely, it was assumed that future grants to Virginia would be of the same magnitude and avail-

able for the same purposes as the grants available for the 1954 and 1955 fiscal years. The allotment for these years, about $10,824,000, was taken as the federal aid appropriation to the state for each of the next twelve years.

Total highway funds are expected to increase from nearly $85,000,000 in 1952–53 to almost $120,000,000 in 1964–65. Over the twelve years remaining in the original twenty year post-war planning period, total highway income is estimated to be $1,039,718,000.

The revenues received by the state for expenditure on the roads are directly related to the amount of travel on the roads, since, in Virginia, most funds have user taxes as their sources. It has been noted that along with the increase in traffic expected by 1965 will be an increase also in available funds. If needs and revenues were generated in the same proportion there would be no highway problem in Virginia. But because it is always necessary to provide highway facilities of greater capacity than the average traffic using them requires, a discrepancy exists between the two. Table V, showing total needs and revenues to 1965, summarizes the deficit predicted:

Table V

SUMMARY OF NEEDS BY SYSTEMS

Primary System		
Total Needs	$768,213,000	
Total Funds	522,644,000	
Deficit		$245,569,000
Secondary System		
Total needs	467,956,000	
Total Funds	398,084,000	
Deficit		69,872,000
Urban Backlog		
Total Needs	138,997,000	
Total Funds	118,990,000	
Deficit		20,007,000
Total Deficit		$335,448,000

The problem is this: during the next twelve years Virginia's highway needs will cost $1,375,166,000 to satisfy. Funds available will be $1,039,718,000. The difference is $335,448,000, about $28 millions a year. It was believed that unless this amount was provided Virginia's improvement program would be gravely retarded.

The 1954 General Assembly, for reasons that are beyond the scope of this paper, did not provide additional highway funds. The department of highways must perforce do the best it can with what it has. Despite the fact that more money will be available for expenditure during the next twelve years, there is every reason to believe that the backlog of needs will continue to grow.

There are three possible sources of help. First, it is conceivable that federal aid will be increased, but to what extent, if at all, it is impossible to predict. Federal estimates for the 1956–57 fiscal year include about $200 million a year more than has ever before been authorized for highway grants, but these estimates are contingent on the retention of the present 2 cent federal levy on motor fuels. If these increases materialize, Virginia would certainly receive some additional aid.

Second, there is a possibility, albeit a remote one, that prices will drop. From a base of 100 for an average of the years 1937–1941, the Virginia maintenance price index had climbed to 213 and the Virginia construction price index to 255 by the end of 1952. A decrease that would alter these indices favorably without causing an adverse reaction in the sources of revenue could afford considerable relief.

Finally, through research new materials and techniques possibly can be introduced which will allow comparable or better work to be done at a reduction in cost. The Virginia Department of Highways has always been alert to new developments in highway engineering. Its five-year-old research unit, the Virginia Council of Highway Investigation and Research, has made several contributions to field work which have resulted in significant savings. In the field conscientious management can, and must, find new ways to stretch the highway dollar while maintaining an acceptable level of quality.

Enforcing Law on Slow Driving

EDWARD SCHEIDT

Mr. Scheidt became Commissioner of the North Carolina Department of Motor Vehicles in June, 1953. A member of the North Carolina Bar, Mr. Scheidt joined the Federal Bureau of Investigation in 1931 and retired January 30, 1953 after twenty-one years of service as Special Agent in various offices of the Bureau. During 1936–37 he did special work for the Institute of Government at Chapel Hill in training law enforcement officers and preparing training manuals for police. As a federal officer he figured prominently in the capture of Bill Payne and Wash Turner, notorious bank robbers of the late 30's. In charge of the New York office of the FBI he led the groups arresting Judith Coplon, Valentin Gubichev, Eugene Dennis, William Z. Foster and other Communist leaders.

IN OCTOBER, 1953 the North Carolina Department of Motor Vehicles and its enforcement arm, the state highway patrol, decided to give increased attention to the problem of the excessively slow driver. This decision, made largely in response to public opinion, was the outgrowth of an intensive program to enforce the speed laws. The more pressure put on speeders, the more pointed became the comments that slow drivers were also a menace—and something should be done about them too.

The new program was announced in the following article which appeared in the newspapers throughout North Carolina:

Raleigh, Oct. 16 (AP)—Motor Vehicles Commissioner Ed Scheidt, who has had his highway patrolmen hot on the trail of speeders, ordered them to go to work today on another traffic hazard—the dangerously slow driver.

Scheidt said the patrolmen would use their radar and electric clock speed detection equipment on the slow pokes as well as on the speeders. A patrolman who finds a driver going dangerously slow will stop the motorist, tell him his speed, "remind him that it is a hazard and ask him to drive in a more reasonable manner in accordance with the flow of traffic," Scheidt said.

He called attention to state law which says that it's illegal to drive so slowly as to impede the flow of traffic. The law says that if after drivers are warned they "wilfully disobey" orders to speed up, they are subject to arrest. . . .

Scheidt said that so far as he knows, the North Carolina patrol will be the first law enforcement body in the nation to use electronic speed detectors on the slow drivers.

"The important thing is for motorists to drive neither too fast nor too slowly, but to drive in accordance with the flow of traffic," Scheidt declared.

For motorists who have some particular reason for driving slowly, Scheidt said the patrolmen would suggest that they pull off the road and allow the speedier traffic to get by.

Press Comment Favorable

The press response to this announcement was highly favorable. In a state whose newspapers, noted for their independence and individualism, rarely agree completely on anything, the papers lined up solidly against the slow driver. Typical comments were:

"One of the most encouraging developments in highway safety in this state in many years," *Durham Herald.*

"Bravo, say we. And thousands of suffering Tar Heel motorists will applaud," *Mooresville Tribune.*

"This will be welcome news to anybody who has been trapped behind a driver more interested in the landscape than in arriving at a destination, and utterly indifferent to the mounting number of cars trailing after him," *Winston-Salem Sentinel.*

"The new policy of prodding the slow driver will meet wide approbation," *Durham Sun.*

"We agree heartily," *Greensboro News.*

"It is about time! The highway patrol does well to prod these slow pokes. The man who drives so slowly that he constitutes a menace to others deserves the same sort of attention as the excessive speeder on the same road," *Raleigh News and Observer.*

"A reform which is long overdue," *Rocky Mount Telegram.*

"We are happy to note that official recognition has finally been taken in our state of the extreme danger of the highway slow poke," *Hamlet News Messenger.*

"It is good to see the state highway patrol move against the slow poke driver," *Wilmington Star.*

"More power to this effort to do something about the slow drivers," *Fayetteville Observer.*

"Health to the campaign against 'hearse' drivers on the highways. Let the good work go on!" *Kinston Free Press.*

The only editorial doubts which came to our attention appeared in the *Franklin Press:*

Now the State Highway Patrol is taking a poke at the slow poke.

No longer will patrolmen devote their efforts to seeing to it that drivers stay within the 55-mile speed limit; they also will see that no driver loiters along at 20 miles per hour. (Wonder what they're going to do about the big trucks going up a hill?)

No longer will it be possible (without a reprimand or a fine) to drive slowly along a Western North Carolina highway, of a Sunday afternoon, and enjoy the view. No indeed! You and I have no right to get in the way of the fellow who wants to go lickety-split, 55 m.p.h., to get—nowhere in particular!

Well, maybe the patrol knows what it is doing. Maybe this speeding up traffic makes sense.

Maybe. But we'd always understood that the chief cause of accidents was speed—not lack of it. And it occurs to us to wonder if the automobile death toll still isn't high enough to warrant the patrol's giving its entire attention to that chief cause of slaughter on the highway—the speeder.

Public Reaction Agreed with Press

The letter-writers overwhelmingly agreed with the newspapers. Sample opinions:

"I noted from the papers you have in mind trying to do something about the slow drivers, and I agree with you," wrote the President of a North Carolina Fire Insurance Company.

A man from Burlington, North Carolina wrote:

"The best thing I have read in ages is your stand on slow pokes in North Carolina."

From the local manager of a company manufacturing trucks and buses came this comment:

"You should be specially commended for the action you are taking on the slow pokes. The writer just completed a trip of several hundred miles in North Carolina and Tennessee and couldn't help but again notice the terrible nuisance of the slow pokes."

A retired newspaper man wrote:

"As a lifelong citizen of North Carolina and one always interested in traffic conditions and safety on the highways, I congratulate you upon your announced purpose to have your patrolmen take action to enforce the law against those who drive so slowly as to impede the normal flow of traffic. . . . How often have I seen one driver hold a dozen cars behind to a speed of 10 to 20 miles per hour. I think some of them get a perverse sort of pleasure out of taking advantage of other people."

A furniture manufacturer in Western North Carolina commented as follows:

"This is something I have long talked about and wished for. . . . Up here in the mountains the problem is particularly important."

From a Greensboro man came this enthusiastic comment:

"To say that I am delighted is to put it mildly. I can imagine that many thousands more will feel exactly the same way. . ."

Only two dissenters wrote in, and curiously, neither was from North Carolina. A lady from Kansas had this to say:

"I read a write-up recently about stopping slow drivers and your set-up was mentioned. I am very much opposed to stopping slow drivers. I think it's entirely a step in the wrong direction."

South Dakota Driver Objects

The other complaint came from South Dakota and merits being quoted in full notwithstanding its length:

"Last summer I spent a good deal of time traveling by motor in your state, from Kitty Hawk to the Great Smokies, and I have very pleasant memories of it all.

"Now I read that you are arresting slow drivers. That I think is ridiculous and a shame. It is high-handed regimentation. In all my driving, all over the country from California to Maine and from Canada to Mexico, over a period of nearly half a century and under all conditions, I have never yet found a slow driver a traffic hazard. True, it is a common sight to see strings of cars following one that obviously is holding them back, but I have rarely seen them running at anything but a reasonable speed, a speed that all should be following instead of only the one in the lead.

"If a car is traveling at 45 miles an hour—plenty fast enough for all ordinary purposes—then cars traveling at 50 or 60 or 70 or more (as many do) naturally will stack up behind it, and every driver who tries to pass it cer-

tainly will be in greater danger, in simple proportion to his speed, than one who tries to pass a car going 30 miles an hour. So your whole idea leads only to an ultimate absurdity.

"You certainly know that *fatal* accidents almost without exception are the result of *high speed,* not slow driving. You would be doing something constructive if you were clamping down on that, and on too close following and reckless passing, instead of careful slow driving. No matter what minimum speed you may establish, you will always have the speeders, the reckless passers, and the close-up-behind daredevils that are the real dangers on the highways —unless and until they are all killed off.

"There are sane and simple steps that should be taken to permanently solve your problem. The first and most important is to provide ample facilities for slow drivers, as well as others, to get off the highway and either pause or stop, when the circumstances warrant, to let other cars pass; and put up suitable signs directed to such drivers. I believe that practically without exception they would be glad to pull off at such places for this purpose.

"You have already many little roadside parks and tables. I myself stopped at and enjoyed a number of them. Yet you need more—far more. As it is, nearly every one of them is occupied even when it is found. There should be one about every two miles or so. They are especially important to sleepy lone drivers. Many a time I have driven on and on when drowsy—a prime cause of accidents, I know—solely because I could find no place to pull off and stop. You will find many long-haul truck-drivers taking naps in these roadside parks.

"Then it should be made illegal for a car to travel at less than fifty feet in the same lane behind another car going 50 miles per hour, and at proportionate distances in relation to other speeds. Many times I have been afraid to slow down in order to pull off at the side (especially upon reaching a suitable spot unexpectedly) with another car following me almost against my bumper, as they very often do. It is such impatient drivers, not the slow ones, who cause and have accidents. The driver in front can neither outrun them nor safely get out of their way.

"There are plently of reasons for you to restrict speed and recklessness. There is *no* valid reason to compel drivers to go faster, just in order to accommodate the insatiable speeders and passers, and you will find that you will accomplish nothing by such a program."

What is a Slow Driver?

A slow driver for purposes of this article is an excessively slow driver or one who unnecessarily drives appreciably slower than the normal rate at which traffic flows. This definition presupposes that road con-

ditions warrant faster speed and that traffic flow is within the legal limits. A test of slow driving is whether the car tends to accumulate a line-up behind it.

The North Carolina enforcement program has afforded the opportunity to find out from large numbers of slow drivers why they poke along. It must be admitted that many of them have good reasons; in fact, even the enforcement official plagued by demands that he "do something about the slow pokes" can often sympathize with the point of view of the leisurely motorists who interfere with the forward progress of others who are in a bigger hurry. One would also sympathize with a blind pedestrian who would like to get across a busy highway, but sympathy should not be carried to the point where dangerous practices are encouraged or tolerated.

It's up to the patrolman to keep traffic moving. In prodding the slow driver, situations may arise reminiscent of the story about the New York policeman who was clearing the sidewalk during a Communist demonstration. "Don't shove me, I'm an anti-Communist," said one man in the crowd. "I don't care what kind of a Communist you are; you can't block traffic," replied the policeman.

Take the case of the slow driver who is riding around for the purpose of enjoying the scenery. It's really a pity to have to interfere with such innocent pleasure; unfortunately his desires conflict with those of a larger number of motorists who have destinations to reach. The patrolman can appropriately suggest to him that he choose less heavily traveled highways and that he keep his weather eye open for cars behind him and help them pass or get out of the way when the road permits.

Other slow drivers whose viewpoint has merit include:

Elderly persons who say that their inferior eyesight and slower reactions make slow driving mandatory.

Drivers of obsolescent automobiles who maintain that mechanical old age prevents or makes inadvisable greater speed. (North Carolina at present does not have a mechanical inspection law.)

Farmers traveling short distances between fields and farms or inspecting their crops from an adjoining highway. Some inspect their fencing from slow-moving cars.

Persons suffering from temporary illness or nausea.

Inexperienced or beginning drivers who lack the confidence to travel faster.

Motorists driving in unfamiliar territory, particularly where the roads are narrow and winding.

Persons apprehensive of speed laws who play it safe.

Good judgment must be exercised in dealing with the above or comparable cases. By making these people more aware of the effect on others of their actions it should be possible to reduce the amount of their interference with traffic, as they are for the most part well-intentioned persons.

Slow drivers with less justification for their actions include:

Day dreamers, who are simply not aware of blocked traffic.

Young people courting as they drive along.

Drunks trying to compensate for their impaired faculties.

Chronic laggards with no excuse at all. They say "I *always* drive slowly."

These people have little or no regard for the rights of other users of the highways and sometimes exhibit a belligerent attitude.

Slow Driving as an Excuse for Others

Any discussion of the slow drivers should take into consideration that not all of the complaints against them are valid or even sincere. It is not unusual for a speeder or reckless driver, when arrested, to demand "Why don't you do something about the slow poke? If it weren't for him I wouldn't have taken chances."

Such statements are in reality attempts to distract attention from the offender's own wrong-doing. There is no logical, moral or legal justification for this attitude. Every driver owes the duty of obeying the law and driving safely in accordance with existing conditions.

As Forst E. Lowery has well stated:[1]

The sloppy thinking of the driver who would make the slow driver the scapegoat proceeds in three jumps. First, he is irritated at a delay. Then he blames the cause of that delay for being the cause of a possible accident. Third, he decides that the slow poke is the cause of "most accidents."

The result: such often heard and read statements as, "A safety-minded and usually law-abiding motorist is often goaded into taking desperate chances to get ahead of such a road-block."

Does a "safety-minded" person take "desperate chances?"

[1] "Scapegoat for Traffic Deaths," *Public Safety*, March, 1954.

Or, put the other way around, is a person who takes "desperate chances" really "safety-minded?"

Is a person who is "usually law-abiding" the same person who is "often goaded" into some law violation?

Although slow drivers don't justify speeders or reckless drivers, the realistic traffic administrator will take human nature into consideration in his enforcement program. The trouble with the slow pokes is that they create conditions which result in more chances being taken by other motorists. The other motorist is wrong in taking these chances, but he still does it and will keep on doing it until the driving public is a great deal more safety-conscious than it is today. Safety promotion and education can reduce the number of people "goaded" into improper, dangerous passing but we might as well face the fact that it won't eliminate them or even cut them in half in the foreseeable future.

We must also realize that a motorist thrown behind schedule by intolerable delays has a tendency to try to make up lost time when he gets the chance and might commit speeding violations when he wouldn't otherwise do so.

On a four-lane highway, two for each direction, the slow-driver problem is insignificant. It is to be hoped that there will be a steady increase in the mileage of such highways, as traffic warrants, thereby reducing the mileage in which slow-driving difficulty is inherent.

It seems clear to the writer that under present conditions, the enforcement phase of the slow-driver problem must be approached from both ends: A violator who takes risks and then attempts to blame the slow driver should receive no sympathy but should be judged with his own actions as the sole criterion; and slow drivers should be prodded with the view of lessening the number of occasions when others are tempted to commit unsafe acts.

The Law on Slow Driving

The North Carolina statute on slow driving reads:

"No person shall drive a motor vehicle at such slow speed as to impede or block the normal and reasonable movement of traffic, except when reduced speed is necessary for safe operation or in compliance with law. Police officers are hereby authorized to enforce this provision by directions to drivers, and

in the event of wilful disobedience to this provision and refusal to comply with the direction of an officer in accordance herewith, the continued slow operation by a driver shall be a misdemeanor."

This law leaves something to be desired. The penalty provided is not for slow driving at all but for contumacy. Anyone who refuses to speed up when told to do so by a police officer probably ought to have his head examined. Untouched by the law are the slow pokes who will move faster when so instructed but continue to block traffic the rest of the time.

The writer can see no valid reason why intentional chronic slow drivers should receive preferential treatment over other motorists who create safety hazards. It certainly never would occur to anyone to suggest that the speeder, for example, should be penalized only if he refuses to slow down when so ordered.

According to press reports, in some states slow drivers have been charged with reckless driving. The reckless driving statute in North Carolina states:

"Any person who drives any vehicle upon a highway carelessly and heedlessly in wilful or wanton disregard of the rights or safety of others, or without due caution and circumspection and at a speed or in a manner so as to endanger or be likely to endanger any person or property, shall be guilty of reckless driving, and upon conviction shall be guilty of a misdemeanor."

It would be a strained construction, in North Carolina at least, to apply this law to the slow driver. Many habitual slow drivers, particularly elderly people, undoubtedly drive slowly because they are trying to be very careful and it is hard to see how excessive caution could constitute recklessness. Furthermore, the usual conception of reckless driving involves actions which are conducive to accidents in a direct and immediate sense, whereas the connection between extremely slow driving and accidents is more remote. Thus a reckless driver can have a disastrous accident all by himself, but slow driving can't be dangerous unless other cars are on the highway and unless other drivers attempt to pass the slow-moving vehicle when they should not.

It seems reasonable to conclude that the legislature never intended slow driving in itself to be regarded as reckless driving in view of the provision that the slow driver statute be enforced "by

directions to drivers," the only penalty being for refusal to comply with such directions.

Why Go After Slow Drivers?

Traffic enforcement should concern itself with all driving practices that tend to produce accidents. Slow-poke driving does this and, therefore, should receive its share of attention.

Stopping slow drivers whenever encountered provides an additional opportunity for the highway patrol to establish personal contact with drivers in the promotion of highway safety. In a large measure these are probably different people from the ones reached in enforcing the more dramatic violations.

It is to be hoped also that slow-driver enforcement, augmented by appropriate publicity, will influence many slow drivers to mend their ways without ever having been noticed or personally warned by a patrolman. It is the writer's observation that in general motorists do just about what they think is required of them if they are to stay out of trouble. By keeping before the public the fact that slow driving is officially frowned upon, a reduction in the number of chronic slow drivers can reasonably be expected.

Another good reason for going after slow drivers is that it helps to win support for the entire enforcement program. Criticism that inordinate emphasis is placed upon speeders is dissipated. The press, if that of North Carolina is any criterion, will enthusiastically support slow-driver enforcement, resulting in a vast amount of additional highway safety publicity and increased safety consciousness on the part of the public.

Finally, law enforcement should be in tune with public opinion. In North Carolina public opinion strongly favors enforcement efforts against the slow driver. It is significant that many editorials greeted the announcement of greater emphasis on slow drivers in enforcement with the comment, "It's about time."

Enforcement Difficulties

The first enforcement difficulty in North Carolina is that the law on slow drivers lacks teeth. The second is that in some instances slow

driving may be the lesser of two evils. The mental or physical condition of the driver or circumstances beyond his control or the mechanical condition of the car may not warrant a faster speed on a specific occasion, and antipathy against slow drivers should not be carried to the point where an indirect hazard is converted into a direct one.

Another problem is how to reach the slow driver when he is at his worst. Cars pile up behind him most when the approaching traffic is the heaviest. A patrolman who meets him has to turn around, fight oncoming cars and thread his way through a long procession. By this time the slow driver may have reached his destination or have turned off the road. Or, upon finally overtaking him, the officer may have no convenient place to stop the driver without further snarling traffic.

Even more discouraging is the fact that for every slow driver who can be caught in the act, untold numbers are doing the same thing unnoticed by the authorities but not by the irritated motorists behind them. In North Carolina there are 68,000 miles of highway to be patrolled by the state highway patrol whose manpower at full strength is 530. Obviously the mileage patrolled at any given time is but a small fraction of the mileage not patrolled.

Technique of Slow Driver Enforcement

Mention has already been made of the difficulty of reaching the slow driver at the time he creates the most hazards. Traditional enforcement methods are not entirely adequate in North Carolina, both because of the amount of maneuvering necessary before the patrolman can get to the slow driver, and because with 530 men to patrol 68,000 miles of highway, the drivers who can be disciplined are hardly a drop in the bucket in relation to the total number of offenders. Of course, for whatever it is worth, patrolmen should give attention to any slow drivers encountered while cruising the highways.

Searching for a better method, North Carolina decided to make use of scientific speed checking equipment. The state has thirty "speed watch" units which compute speed electronically and five radar units. This equipment has proved very effective in combatting speeders. Why not use it at the other end of the speed spectrum? As

far as the writer has been able to determine, no other state has thought of employing these devices against slow drivers.

It appears to be a valid assumption that the habitually slow driver will drive in the same habit pattern whether traffic is piled up behind him or not. If this is true, there is no reason why he shouldn't be warned even if, at the moment, he has the highway to himself.

By placing the scientific equipment at places on the highway where low speeds are not justified, the operator can police speeders and slow pokes simultaneously. Since such equipment is invariably placed so that violators can conveniently be stopped and made to pull over out of the way of traffic, the arrangement is ideal for dealing with slow drivers. The contact with the motorist is under controlled conditions most favorable for the patrolmen, and all hazards are removed from the equation.

The use of radar and speed watch devices to detect the slow driver has the added value of capitalizing upon the wholesome respect which a large segment of the population already has for such devices.

At present no reliable yardstick is available to measure how much effect the techniques employed have had on slow driving in North Carolina. We anticipate, however, that from continued attention to this problem will result a definite improvement in conditions. In the meantime, a fund of good will is being built by the Department of Motor Vehicles because of its willingness to tackle in a positive manner a problem which has been a source of irritation to the motoring public.

New South African Town Designed to Prevent Traffic Problems

WM. O. BACKHOUSE

Mr. Backhouse for the last thirteen years has been a town and regional planning consultant in private practice in South Africa. Previously he was for nine years county planning officer for town, regional, and highway planning for the Salop County Council, after which he held a similar position with the Northumberland County Council (Great Britain). Mr. Backhouse is at present consultant to the Anglo American Corporation of South Africa, for whom he is designing two new towns in the Orange Free State Goldfields in South Africa, and one new town in the Copperbelt of Northern Rhodesia. He is also consultant to many municipalities throughout South Africa. Each year he travels to various countries in Europe to attend council meetings and Congresses of the International Federation for Housing and Town Planning; the South African Government arranges for him to meet leading experts on highway design, traffic problems and planning. Mr. Backhouse is a member of the Town Planning Institute (Great Britain) and of its Southern Africa Branch, the American Society of Planning Officials, and of the International Federation for Housing and Town Planning.

IN 1945 the site of the town of Welkom was merely fields, miles from a rail head, fifty miles from the nearest town, to which it was connected by a rough earth road. There was no electric power, bricks and coal were 150 miles away and the only water was a few farm boreholes, most of which delivered brack water.

Now Welkom has 17,000 Europeans and an equal number of non-Europeans living in houses; it has two railway stations, a water supply taken from the Vaal River fifty miles away, tarred roads in all directions and an aerodrome.

The reason for the town is the valuable gold and uranium deposits in the area.

At the end of the second world war the Anglo American Corporation of South Africa Ltd., the biggest gold and diamond mining organization in the world, decided to create two new towns to house

the population necessary for the development and working of the mines.

The chairman of the Anglo American Corporation, Sir Ernest Oppenheimer, instructed that the towns should be designed in accordance with the most modern principles of town planning as determined by practice and experience in the world at large. Welkom and Allanridge are two of the new towns being developed by that corporation and in this article Welkom planning will be considered.

The town, to be more than a mining township, was to combine the aesthetic qualities of a garden city with the utilitarian requirements of ordinary commerce and industry, and the economics adjusted to the conditions of an inflated cost structure with a pre-war price for its primary product, gold. The controlling authorities and many persons who had a say in the development of the town knew little or nothing about modern town development and some were reluctant to give approval to types of planning they had never seen and did not understand.

In 1946 it was necessary to commence the erection of houses to accommodate the workers who were to develop the six gold mines around Welkom. It was considered inadvisable to delay the planning of the first residential areas until the controlling authorities approved modern layouts, so some of the most desirable street patterns were not pressed for and a compromise layout was adopted.

Survey of Faults in Existing Towns

In analyzing the faults of existing towns in South Africa, Europe and the Americas, it was found that congestion at the town center was caused by too much bulk of building on too little land; the intermingling of shops, offices, flats, hotels, theaters and industries; the loading and off-loading of merchandise from the fronting streets, and lack of adequate parking facilities.

Also it was found that there is very little relationship between the traffic to shops, offices, flats, etc., and the intermixing of these developments caused considerable amounts of cross-traffic. There was a lack of wide roads connecting the town center with the suburbs, and in the suburbs the schools and open spaces were poorly

located in relation to the population, necessitating pedestrians—and particularly school children—to walk through streets that carried a considerable amount of traffic.

These faults affected not only the safety and pleasure of the inhabitants but also the economics of the towns.

Poorly designed roads and intersections, illogical street patterns, the wilderness of tarred surfaces, etc., caused many accidents. In an endeavor to prevent accidents, many traffic controls were installed and these in turn caused frustration.

In most towns, shops are developed along street frontages separated from the traffic only by narrow foot-paths. As the fronting buildings get higher and higher, the shopping streets become dust and draught corridors. There is little comfort, pleasure or safety for the shopping public.

Roads and streets were not designed for specific purposes and it was difficult to differentiate between residential streets, minor traffic arteries and major roads. Where towns were developed on the gridiron pattern, all roads were through-roads and all intersections potential danger points.

These were only some of the faults encountered, faults which were not to be permitted in Welkom.

Town Planning and Human Factors

The psychology of citizens was studied to ascertain how town development could be adapted to the human make-up. Much scientific research has been undertaken to improve the motor vehicle and results of that research have been incorporated in motor designs. Considerable research has gone into highway design and traffic problems yet relatively little application of the results have been incorporated in the development of towns and highways.

Motor vehicles and streets and towns are harmless until they are taken over by human beings. Yet we find that very little investigation has been made into the human factor. Of the three senses, sight, hearing and touch, the normal reactions are less sensitive to sight than to sound or feel. In spite of this almost all traffic controls are of the visual kind.

Also human beings can be led but rarely driven; yet nearly all controls are repressive. Human beings accept and like responsibility: take away the sense of responsibility and a negative psychology is created.

The psychological aspect requires very much more research, and investigations are necessary to ascertain how human reactions can best be utilized to secure responsible driving of motor vehicles.

Controls should, as far as possible, not be obvious. While there is no statistical proof, undoubtedly frustration, with its subsequent mental reaction, is a contributory factor in many accidents. Elementary endeavors in this direction are recommended in the planning of Welkom, which are mentioned later.

The Planning of Welkom

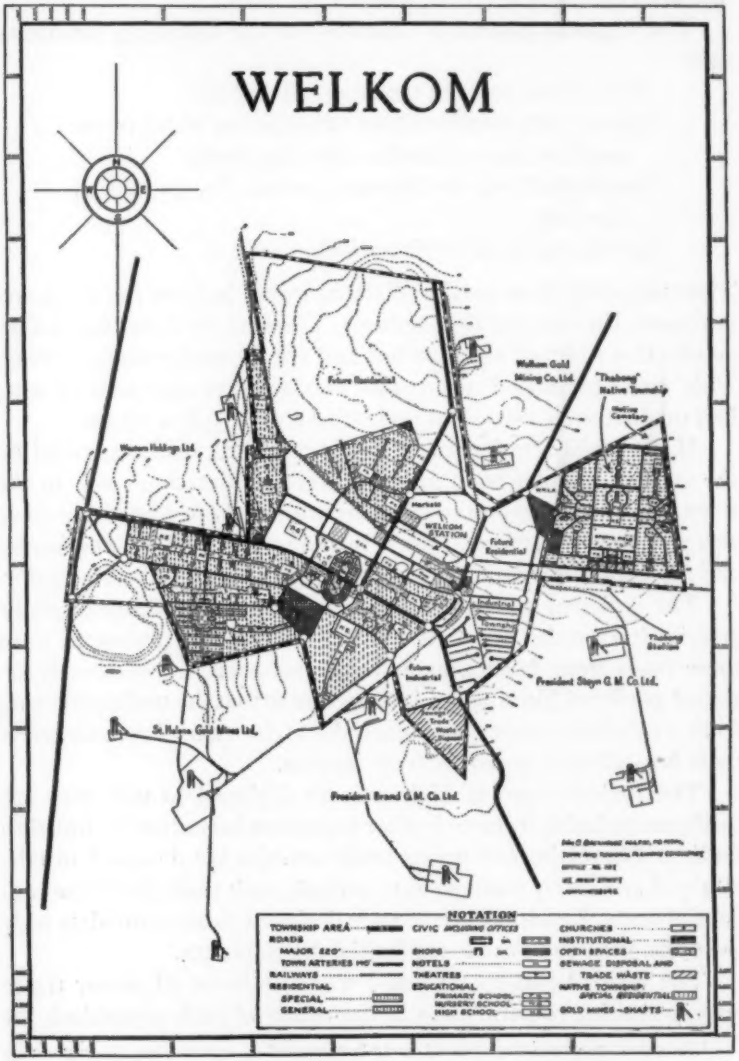
Welkom is based upon the establishment of six gold mines which will also produce uranium. From a knowledge of the Witwatersrand and the limitation of available water it was possible to calculate the population in time periods and derive a reasonable estimate of the ultimate population, viz. 80,000 Europeans and approximately the same number of non-Europeans, making a total of 160,000.

Also it was possible to calculate the population/motor vehicle ratio. At present the population/motor vehicle ratio is: one motor vehicle to 3.8 European population in South Africa. Welkom is planned on the basis of one motor vehicle to every three of the estimated European population, giving an estimate of 26,666 motor vehicles ultimately. A considerable surrounding population will use Welkom as a central town which will justify that ratio.

The main considerations in planning the highway and street pattern were based upon the following known factors:

Welkom would be the largest and most central town in the new goldfields area, necessitating easy traffic flow from the outside areas to and from the town center. Six gold mines would surround Welkom, necessitating easy traffic between the residential areas and the mines. A considerable amount of road traffic would be necessary between the industrial area and the mines. The intermixing of unrelated traffic would cause congestion.

Northern orientation of dwellings and offices is the most desirable in South Africa, so development streets would have to be mainly



Master plan and position of five of the six gold mines

east/west. Planned traffic circulation could avoid congestion and restrictive traffic control, and on the basis of these known factors, endeavors were made to ensure a fluid traffic flow.

The highway pattern is classified for the following functional uses:

Major traffic arteries 220 cape feet width.[1]
Minor traffic arteries 140 or 120 cape feet width (these roads are internal traffic collecting roads)
Residential and development streets 60, 50 and 44 cape feet
Special streets of varying width.

The main traffic from outside Welkom would be from the north and northeast; the west and the southeast. These routes were planned for an effective width of 220 cape feet and are the major traffic arteries. This width permitted two 33-foot carriageways separated by a 54 foot median strip, two 9-foot cycle tracks, two 10-foot verges.

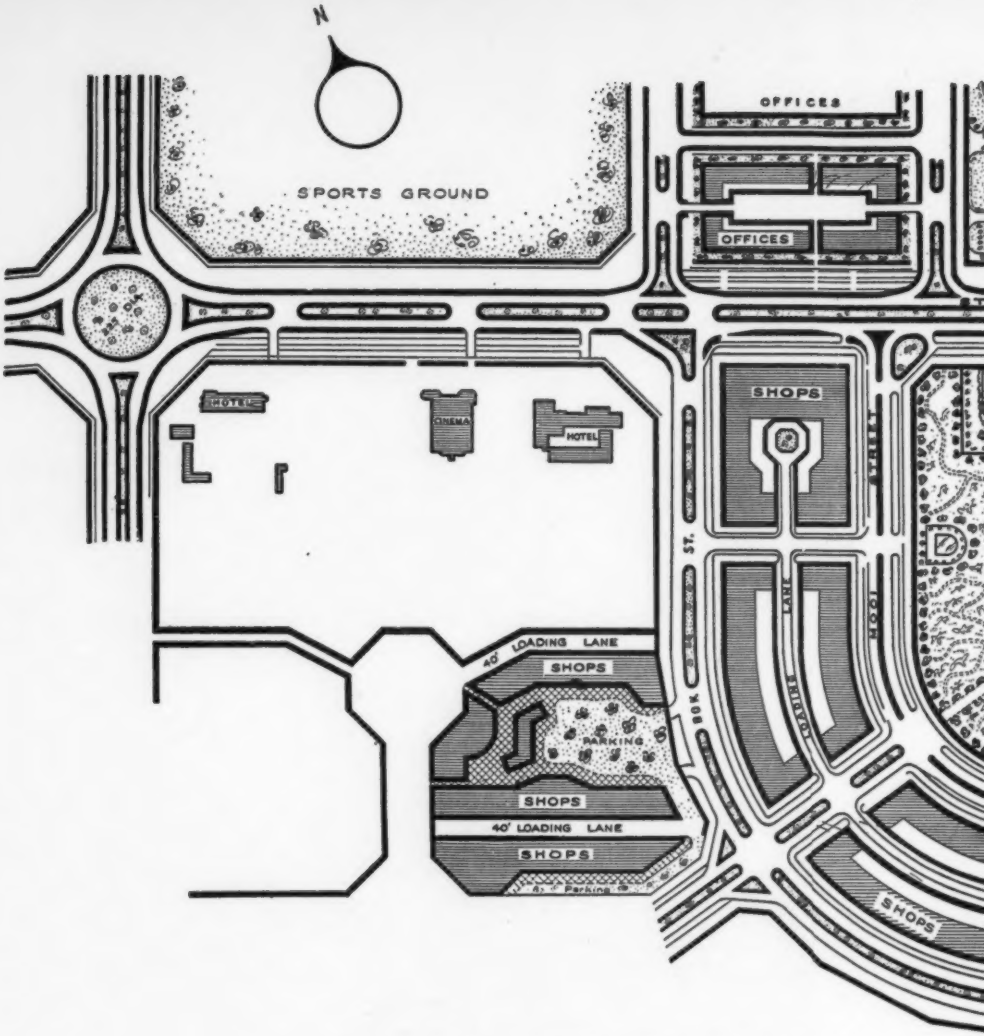
Minor traffic arteries are the traffic-collecting roads surrounding the various neighborhood units and certain direction roads in the town. These are 140 or 120 cape feet wide and are planned to have two 24-foot carriageways, a wide median strip, cycle tracks, verges and footpaths. The buildup varies according to the nature of traffic.

The designed maximum speed on the major and minor traffic arteries is 45 miles per hour. Unlimited access is permitted onto these roads from development streets but each intersection is designed as a flared filtering bay intersection so that the traffic emerging from a subsidiary street filters into the main traffic flow only when there is a sufficient gap in the traffic stream.

The various types of highways are designed so that they are easily recognizable from each other to prevent hesitation in direction finding. The major and minor traffic arteries are designed to take all rapid and heavy traffic so as to exclude such traffic from the residential areas. Residential streets are designed to accommodate only the traffic incidental to the residential development.

The general pattern proposed was culs-de-sac off minor traffic arteries leading to park strips in the center of each superblock (or

[1] For survey purpose street widths have to be measured in cape feet but the engineering buildup of the highways is in English feet. 100 cape feet = 103.3 English feet.

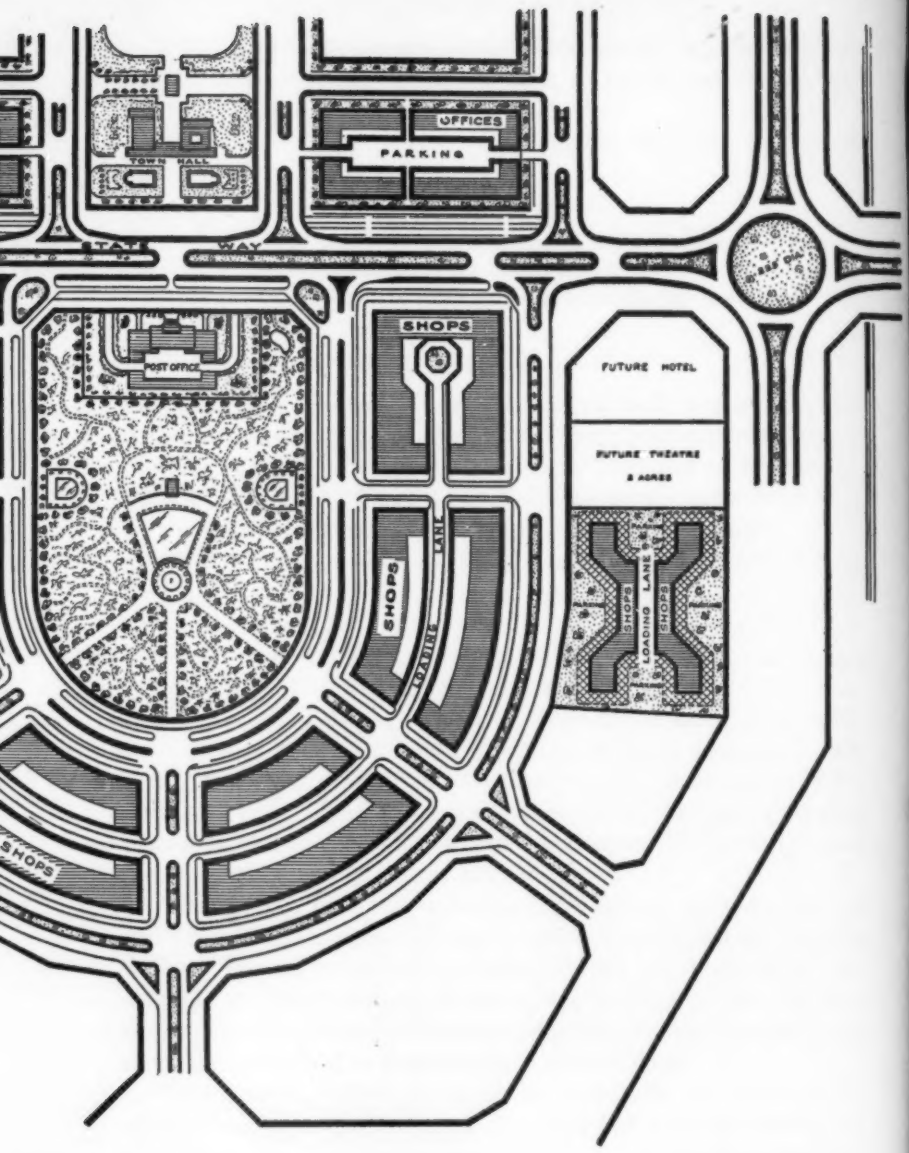


Cross-Section: Mooi Street

Cross-Section of State Way

NOTE: 100 Cape Feet = 103·3 English Feet

Welkom, Civic Zon



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neighborhood unit). In design, make-up and intersection, residential streets are fundamentally different from major or minor arteries so that traffic cannot mistake them for through-traffic routes. They are designed to take only the traffic incidental to the frontage development. Where the residential streets are looped or cul-de-sac design they connect with traffic-collecting roads at one end and park wedges at the other.

On account of the limited amount of fronting development the residential streets are safe for pedestrians and the construction costs are low. This system of low cost development streets leading to traffic-collecting streets makes a very economic street pattern. The collecting streets are either minor or major traffic arteries.

The law relating to subdivision of land in South Africa precludes many desirable types of residential development as each building plot must have a frontage onto a defined street.

State Way Bisects Welkom

State Way is a major artery which runs east/west bisecting the town. The traffic on this road is mainly directional to and from the town center. About the middle of the length of State Way is the town center, developed as a horse-shoe shopping zone to the south and another horse-shoe civic and office zone to the north.

Fluid flow of traffic is planned on State Way even at the town center where the design is for directional flow of traffic at a maximum speed of 45 miles per hour. The part of State Way traversing the town center is two-thirds of a mile at each end of which is a rotary intersection connecting with a major artery on the east and a minor artery on the west. The calculated approach speed at the rotary intersections is 31.5 M.P.H. and the rotary speed, 25 M.P.H.

The rotary carriageway consists of three traffic lanes with the crown line for superelevation one and two-thirds traffic lanes from the center island. One hundred and fifty feet weaving distance is allowed on the rotary system. The reduction of traffic speed at the rotary intersections will cause bunching of traffic which will ensure sufficient traffic gaps to permit filtering of traffic from the intersections between the two rotary systems.

The development abutting on State Way between the two rotary systems is:

North Side from west to east: Central sports ground; office blocks; central park in which the town hall will be built; office blocks; future office blocks.

South Side from west to east: Hotel; two theaters; hotel; shop block; central park in which the post office will be built; shop blocks.

The build-up of the road consists of two 2-lane carriageways of 24-foot (English) each, separated by a median strip of 40 feet (E). On the outer side of each carriageway is a 9-foot (E) cycle track. Next to the cycle tracks on each side of the road are two rows of 45° angle parking with 12-foot (E) maneuvering lanes.

The parking bay on the south is separated from the shops by an 18-foot (E) wide footpath and on the north there is an 8-foot (E) verge and a 9-foot (E) footpath and 21-foot (E) gardens separating the parking bay from the offices.

The inner horse-shoe roads on the north and south of State Way are designed as traffic storage roads and cross traffic between them across State Way is purposely made difficult. The reason for this is to keep these streets free from traffic except that incidental to the abutting shops or offices. Bus traffic and traffic between the shops on the south and the offices and civic buildings on the north will be along the outer horse-shoe roads or farther out to the two rotary intersections.

The median strip is broken where it is desirable to permit turning of vehicles and the break is sufficiently wide to permit vehicles to stand without obstructing a traffic lane while they wait to filter into the traffic stream. Intersections, other than the rotary intersections, are designed as fluid filtering bays and traffic emerging onto State Way filters into the traffic stream only when there is a sufficient traffic gap.

Traffic crossing State Way stands in a filtering bay until there is a sufficient traffic gap, then proceeds over a 24-foot carriageway to the break in the median strip where it again waits for another traffic gap before proceeding over the other 24-foot carriageway. The

amount of traffic crossing State Way between the two rotaries is small and there is no need for traffic control other than canalization and storage gaps in the median strips. As the traffic is directional on each carriageway and the width of each is only twenty-four feet, pedestrians can cross at any point although crossing places are designed over which the pedestrian has the right-of-way.

The median strip, islands, and cycle-track are designed so that they can be mounted in an emergency. To bring to the notice of a driver that he is on the edge of the carriageway, low sloping kerbs are studded or waved longitudinally with small amplitude, and the texture and appearance of the cycle track or median strip are different from those of the carriageway. Immediately on leaving a carriageway a driver will be made conscious of the fact by the slight upward tilt of the vehicle when riding the sloping kerb, the feel of the studded or waved kerb, the sound caused by the difference in the surface material and the different appearance of the surface.

These features will react on three different senses, sight, hearing, and feel. Nobody has yet been able to calculate the magnetic attraction between a tree, light standard, pole or other obstruction and a motor vehicle. Yet, when a vehicle leaves a carriageway, if an obstruction can be found, it will be struck. To avoid such collisions, all street furniture and trees have been designed well away from the carriageways.

In studying the plans it should be realized that in South Africa vehicles are driven on the left side of the road.

Theaters, Hotels and Shopping Areas

Theaters and hotel plots are at least two acres each and the buildings are set back to a building line of at least fifty feet. The parking requirements for theaters are one parking lot for every six seats and for hotels, one for each guest room or suite and sufficient for bar and lounge trade to be determined for the position and type of hotel. The hotels and theaters are sited away from the shopping areas to avoid mixing of traffic.

The main shopping area, which is formal to give character to the town center, is designed between two horse-shoe shaped roads, each

140 cape feet wide. The inner horse-shoe road, Mooi Street, has a fourteen-acre park on the inner, and shops on the outer side. Only traffic incidental to the shops is encouraged on this road; no bus or heavy traffic will be permitted and the street is intended as a safe pedestrian and car storage street incidental to the shops. Throughout its length provision is made for three rows of 45° angle parking which will accommodate 500 vehicles.

The outer horse-shoe road, Bok Street, can accommodate 600 vehicles and this road is the planned bus and heavy traffic road for the shopping area. Mid-block there are loading lanes 50 feet wide, so that all loading and off-loading takes place at the back of the premises. One hundred vehicles can be parked along the road in the loading lanes. The loading lanes can never become shopping streets because no shop frontages on them are permitted.

The connecting streets between Mooi and Bok Streets can accommodate some 150 vehicles, making a total of 1,350 parking spaces on the roads. In addition some 300 vehicles can be parked on the shop sites which are 120 cape feet in depth.

The original proposal for the shopping blocks was a depth of 200 cape feet with a maximum coverage of 40 percent to allow a considerable amount of off-street parking. Due to pressure, this was diminished to a block depth of 120 cape feet and 66 percent coverage on the inner lots and 75 percent on the corner lots, thus diminishing the amount of off-street parking considerably.

Abutting on the outer side of the outer horse-shoe road, Bok Street, are areas for smaller shops designed on less formal patterns. These are essentially pedestrian shopping areas with pavements 25 feet wide, and off-street parking areas providing one parking space for every 200 square feet of shop or office floor area. The irregular design of these collective shopping areas, the first of which will be built this year, will make an attractive and safe amenity in the town.

Other than shops, the only development permitted in the central shopping area is the smaller type of offices; no flats or industries are permitted. The average height of buildings permitted is slightly over three stories.

Shopping in Welkom is designed to be a safe and pleasant part of the life of the citizen in contrast to the drudgery of most towns. The

Optima Quarterly of Anglo American Corporation of South Africa. G. A. Campbell, artist

This is a perspective, drawn in 1949 before all details were fully worked-out, of the Southern half of the Welkom Civic Zone (shops, central park, post office and hospital in the background). This does not indicate the correct build-up of the roads.

Optima Quarterly of Anglo American Corporation of South Africa. G. A. Campbell, artist

This is a perspective, drawn in 1949, of the Northern half of the Welkom Civic Zone (town hall, public library, museum and art gallery).

shopper will be able to leave the car near to the shop, walk safely about the shopping area and leave children to play safely in the 14-acre central park. People buy cars to use them, not to leave them at home or on distant parking places: Welkom is designed to enable the people to get to and leave their cars near their destination.

Civic Center and Office Blocks

On the northern side of State Way, opposite the shopping center, is the civic center and the larger offices and banks. Centrally situated is an 11-acre park in which will be built the town hall, public library, museum and art gallery. Around the park are sites for the government and local government offices, the magistrates' and high courts, banks, mining corporation offices and the building society and insurance offices.

The office blocks are designed on the center court basis to give as much north-south orientation as possible. Provision is made for parking in the ratio of one parking place for every 200 square feet of used floor area. Traffic circulation to the office area is along the outer road, and the inner road abutting the park is mainly for parking. The traffic and parking for the civic and office buildings does not intermix with the shopping vehicles. The recommended bulk of building is three stories and 50 percent coverage. No flats are permitted in the shopping or civic centers, nor intermixed with dwelling-houses. Generally, flats are located on sites of two acres and over, next to parks. The maximum density of population permitted in flats is 80 persons per acre, and parking provision has to be made in the ratio of one space for each dwelling unit.

Super Blocks or Neighborhood Units

In the conception of the super block design the choice lay between the logical street pattern with its convenience and economy or the pretty picture layout with a street pattern which had no reason.

Orientation of houses is important and houses are best designed to face north. In the summer when sunshine is not wanted in the houses, the sun is directly overhead, but in the winter the lower angle

of the sun from the north is very desirable. The street pattern is determined by the preference for north-facing houses.

Depending upon the necessity for directional traffic roads, super

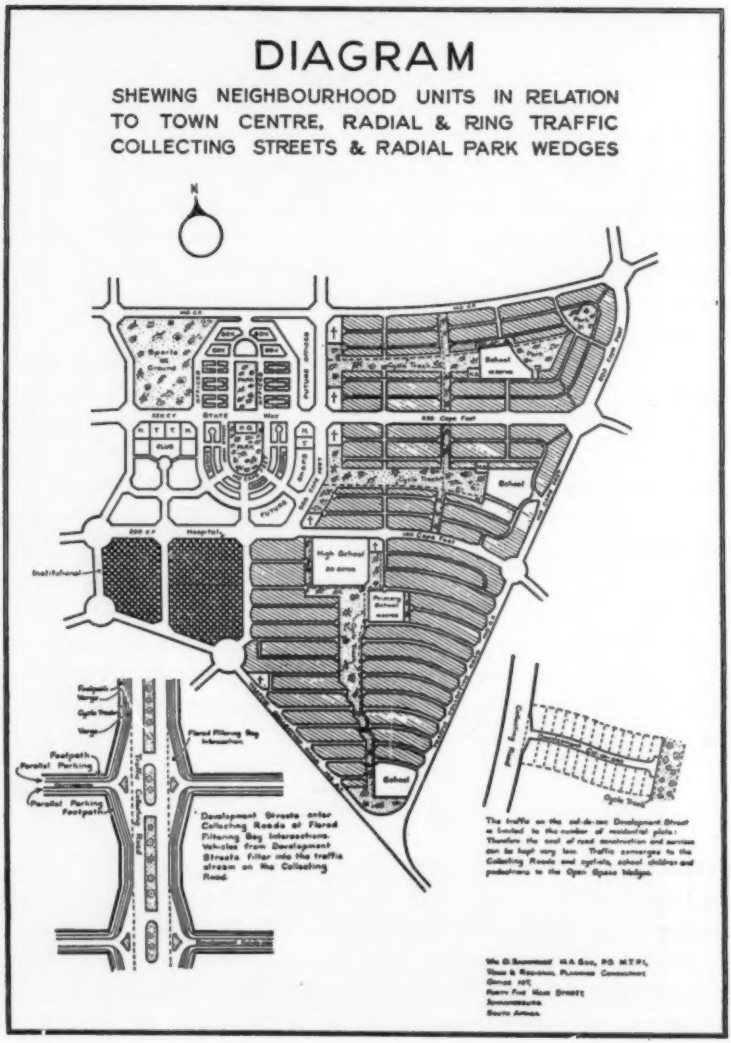


DIAGRAM
SHEWING NEIGHBOURHOOD UNITS IN RELATION TO TOWN CENTRE, RADIAL & RING TRAFFIC COLLECTING STREETS & RADIAL PARK WEDGES
N
Sports Ground
School
Cycle Track
Hospital
High School
Primary School
Institutional
Footpath
Parallel Parking
Development Streets enter Collecting Roads at Flared Filtering Bay Intersections. Vehicles from Development Streets filter into the traffic stream on the Collecting Road.
The traffic on the cul-de-sac Development Street is limited to the number of residential plots: Therefore the cost of road construction and services can be kept very low. Traffic converges to the Collecting Roads and cyclists, school children and pedestrians to the Open Space Wedge.

blocks are designed to enclose the required population for one or two primary schools; this is 450 or 900 dwelling-houses. The object in the planning of Welkom is to provide good amenities combined with safety and convenience.

This has been achieved by surrounding each super block by wide fast traffic-collecting roads and providing a park radiating from the town center through the center of the unit. Schools, children's playgrounds, open air amphitheaters, tennis courts, bowling greens, etc., are located in the park strip in which are also cycle tracks.

The residential street pattern is designed to encourage traffic to leave the unit and converge onto the surrounding fast traffic-collecting roads, and for pedestrians, school children and cyclists to converge to the park strip in the center of the unit.

It is common practice throughout Southern Africa that European houses are detached, usually single story. On the site are also erected a garage and native servant quarters. The smallest residential sites are one-fifth or one-fourth acre and the controlling authority would not permit a frontage onto the street of less than 70 cape feet.

These provisions make the housing densities very low and involve long and expensive roads and services and high public transport costs. This is one of the reasons why even the lower income groups have their own motor car which is used to proceed to work, to do shopping, and attend sports and entertainments. Children and non-Europeans use bicycles extensively.

The street pattern recommended as providing the best orientation, amenity, safety, and economy was the cul-de-sac leading from traffic-collecting roads to the central park strip. The amount of traffic on any cul-de-sac is necessarily limited to that incidental to the frontage development. With such limited amount of traffic, the cul-de-sac is not dangerous and the construction and maintenance costs are very low. Also it is easy to locate properties, and traffic flow is simple.

Vehicular traffic proceeds along the cul-de-sac to the traffic-collecting road on the outside of the unit. The intersection between the cul-de-sac and the traffic-collecting road is a flared filtering bay. If no traffic is proceeding along the traffic-collecting road, vehicles from the culs-de-sac can enter but as the traffic on the traffic-collecting

road has the right of way, the cul-de-sac vehicles must wait in the filtering bay for a sufficient traffic gap. Once on the traffic collecting road, progress is fluid.

This traffic system expedites traffic flow, keeps drivers contented and prevents frustration. Pedestrians, school children, and cyclists converge to the park strips which are designed to link with the town center and the country outside the town. To link park strips on either side of the traffic roads underpasses are planned for pedestrians and cyclists.

The Industrial Township

The industrial township has been subdivided into areas where railway sidings are necessary and those not requiring sidings. But these divisions have been further divided for wet and dry industries and again for food and other industries. Also a motor town has been planned in the dry section where no sidings are required.

These subdivisions simplify traffic flow, make location easy and prevent intermixing of traffic. The layout provides that there shall be grade separation at the only three points where road and rail cross. The general pattern of road and rail layout is by cul-de-sac roads on either side of cul-de-sac railway routes.

The traffic-collecting roads are on the outside of the township and the cul-de-sac roads run towards the center; the collecting railway track is in the center with the cul-de-sac spurs towards the outside.

The Mines Native Hospital is on a site of fifty acres, the European Hospital is on twenty-six acres and the Nursing Home on one or more acres, depending upon the size.

Motor garage sites are at least one and a half acres in area and the buildings must be set back at least fifty feet from the highway.

The markets are sited near the railway station, the wholesale market having rail sidings. Between the wholesale and retail markets a parking area of some six acres is provided.

Traffic Control in Welkom

The planning of Welkom is designed so that traffic will flow freely in the desired direction without intermixing with unrelated traffic

and without frustrating restrictive traffic controls. Adequate parking provisions have been made and traffic streams segregated. Provision has been made for cyclists by cycle tracks on the traffic routes and in the park wedges. Intersections have been designed to keep traffic moving but safe.

Every endeavor has been made to give back to the driver the responsibility he loses when unnecessary petty controls are imposed. Frustration has been eliminated and the driver is guided into his correct place on the roads at a speed which gives safety and satisfaction. Pedestrians can cross the roads safely because with directional carriageways separated by wide median strips, only twenty-four to thirty feet have to be crossed at a time.

While the ideal has not been achieved in Welkom, mainly because the conception was entirely new to many of the controlling authorities who have from time to time altered the planned proposals, much has been accomplished.

Mistakes have been made and will be made; nevertheless much has been achieved which will make a useful contribution to new town development.

Baltimore's Teen-Age Court

JUDGE STANLEY SCHERR

In 1946, Judge Scherr became general counsel to the Baltimore Housing Authority, succeeding Philip Perlman when he was named Solicitor General of the United States. In May, 1951, he was appointed chief judge of the Traffic Court of Baltimore City. He is a member of the Baltimore and American Bar Associations.

BALTIMORE'S Teen-Age Court, established on October 6, 1951, is a new judicial approach to the problem of reckless youthful drivers. Its purpose is to deal intelligently and effectively with our young drivers in an all-out endeavor to have them both appreciate and realize their responsibility while behind the wheel of an automobile.

This court came into being when we found ourselves trying approximately 500 cases a day involving an astonishing number of teen-agers, that is, between the ages of 16 and 21. In Baltimore, as in other jurisdictions, certain motor vehicle violations can be paid out in lieu of the defendant's standing trial: failing to obey an automatic signal, failing to stop at a boulevard stop sign, etc. This practice applied also to teen-agers. Although the traffic court is a criminal court, and a record obtained there remains with the violator the rest of his life—the same as a record in any criminal court—and although many teen-agers were charged with serious motor vehicle violations, approximately 2 percent of these teen-agers' parents or guardians appeared with them in court. We found that the teen-agers, naturally with exceptions, had not only bad driving habits, but they also had poor attitudes toward motor vehicle enforcement and courts in general. Their attitude upon seeing an adult given a jail sentence was: "I am a teen-ager; they would not dare send me to jail."

To study this serious problem of dealing properly with teen-agers and improving their attitude, a thorough investigation was made from the time the teen-ager received his summons or citation from the police officer. The teen-ager would take the citation home, relate to his parents how the officer picked on him and singled him

out from all the motorists on the road; when the fine could be paid out instead of having to stand trial for the violation, the parents would write out a check in the amount of the fine, address the envelope, lick the seal and stamp, and deposit the envelope with the fine addressed to the traffic court. In many cases parents felt their child was discriminated against.

In cases of this kind the teen-ager would have no more knowledge as to the seriousness of his offense after his parents paid the fine for him than he did before the fine was paid. In other words, permitting the teen-agers to pay out the fines in lieu of standing trial made the whole procedure too simple and easy. Their attitude was, "If I get a ticket, give it to Mom or Pop and they will take care of it."

Therefore, our first innovation was to prohibit teen-agers from paying out fines for any violation with the exception of parking, so that today all teen-agers must appear in court, stand on their own two feet, and take the consequences for their acts.

Youthful Violators Brought to Court

Our next innovation was to start a Teen-Age Court by naming the court as such, and through the cooperation of the police department to have police officers assign all teen-age violators for trial in this court, as distinguished from other court sessions. The Teen-Age Court meets on Saturday morning at 9:00 o'clock, so that the youths will not have to miss time from school. If an adult is involved in an accident with a teen-ager, the entire case is brought into the Teen-Age Court.

The first order of business is the showing of a safety film, which has proved most beneficial to the teen-ager, witnesses, spectators and police as well. Following this, the judge relates briefly the purpose of the Teen-Age Court:

"This Court is an endeavor to help you and not to hurt you because we feel that if you are shown where you have made your mistake, you will become a careful and prudent driver on the highways, not a hazard. In the business of operating an automobile you can never tell but what your first mistake may be your last, or the life you save may be your own."

The cases are then called. Formerly, when teen-agers were tried in other sessions of court prior to the starting of the Teen-Age Court fewer than 2 percent of the parents accompanied their children; today, approximately 70 percent of the parents appear with them and for the first time hear both sides of the story. As a result the attitude toward law-enforcement and courts has greatly improved. Under the previous system 80 percent of the teen-agers pleaded "not guilty," because they followed the pattern set by the majority of adult violators who plead "not guilty." Today 95 percent of the teen-agers plead "guilty"; not because they are afraid to plead otherwise, but because they feel they have a friend behind the bench who understands their problems and not someone with a mallet who is ready to club them over the head because they have erred.

If the teen-ager is charged with going through a light, improper speed, or some similar offense, and has no previous record, he is placed on probation. This means that if he satisfactorily completes his probationary period of six months, his violation will not be on record against him. His probation consists of attending weekly the church of his denomination, attending traffic educational classes twice a month, at night, at which time he receives different pamphlets on proper driving, again views safety films, hears lectures from members of the city and state police departments, and is put through time reaction machinery. He is then given a written examination, and if he satisfactorily completes this probationary period, and passes the examination (no one has as yet failed) he is given a card of satisfactory completion at a regularly scheduled graduation exercise. All of these activities are extra-curricular, and no extra compensation is paid to the judges or to Mr. Joseph Caskie in charge of the probation department.

If the teen-ager who is found guilty has a record, he is not placed on probation because he already has a record, as distinguished from the youth we are endeavoring to have grow up without any blemish in the form of a record against him.

If the teen-ager, while on probation, commits another offense, he is taken off of probation, the fine is assessed against him for both the offense for which he received probation, and the current offense. Moreover his license is suspended.

We have graduated approximately 2500 and have at present approximately 1500 on probation; we have had only 3½ percent repeaters and only three out of this number were involved in moving violations.

In instances involving serious teen-age violations, the offenders are not pampered but are given jail terms commensurate with their violations, with the deterring effect that teen-agers know they are subject to the same penalties as adults for their acts in the operation of an automobile.

In my opinion, Baltimore's Teen-Age Court is an exceptionally fine pattern for many other cities endeavoring to cope with and solve the problems of teen-age driving.

Seattle's Freeway System

E. E. LEWARCH

Mr. Lewarch joined the staff of the traffic engineering division of the Seattle Engineering Department in 1941. He has served as traffic engineer of the City of Seattle since 1952. He holds a certificate from the Bureau of Highway Traffic at Yale University, is an associate member of the Institute of Traffic Engineers and a member of the Highway Research Board Committee on Urban Volume Characteristics.

THE City of Seattle is situated on an isthmus of land between two large bodies of water, Lake Washington to the east and Puget Sound to the west. A ship canal for the passage of ocean-going vessels between Puget Sound and Lake Washington bisects the isthmus at the geographical center of the city. The interchange of vehicular traffic between the area north of the ship canal and the area south of it is provided for by five-bridges—one high-level fixed-span bridge and four low-level bascule-type drawbridges, which span the canal and link the residential areas to the north with the business and industrial areas to the south.

The central business district is located on the western portion of the narrowest point of the isthmus approximately one mile south of the ship canal, between the tidal waters of Elliott Bay and a ridge which defines the eastern boundary of business development. The ridge, approximately 1,200 feet from the waterfront at the south end of the business district, is a topographical configuration which restricts the area available for street location. As a result of this restriction and because of the location of terminal facilities serving four transcontinental railroads immediately to the south, only four arterial streets provide access to the central business district from the industrial and residential areas situated in the southern portion of the city.

Three of these streets extend through the core of the central business district and one, Alaskan Way, skirts the western edge of the district and provides access to the piers on the waterfront of Elliott Bay.

The city's major industrial area lies to the south of the central district on reclaimed tideland area and in the Duwamish River valley. Secondary residential areas to the east on the shores of Lake Washington and to the west on the shores of Puget Sound are separated from the industrial valley by ridges rising to elevations of 400 feet above the valley floor.

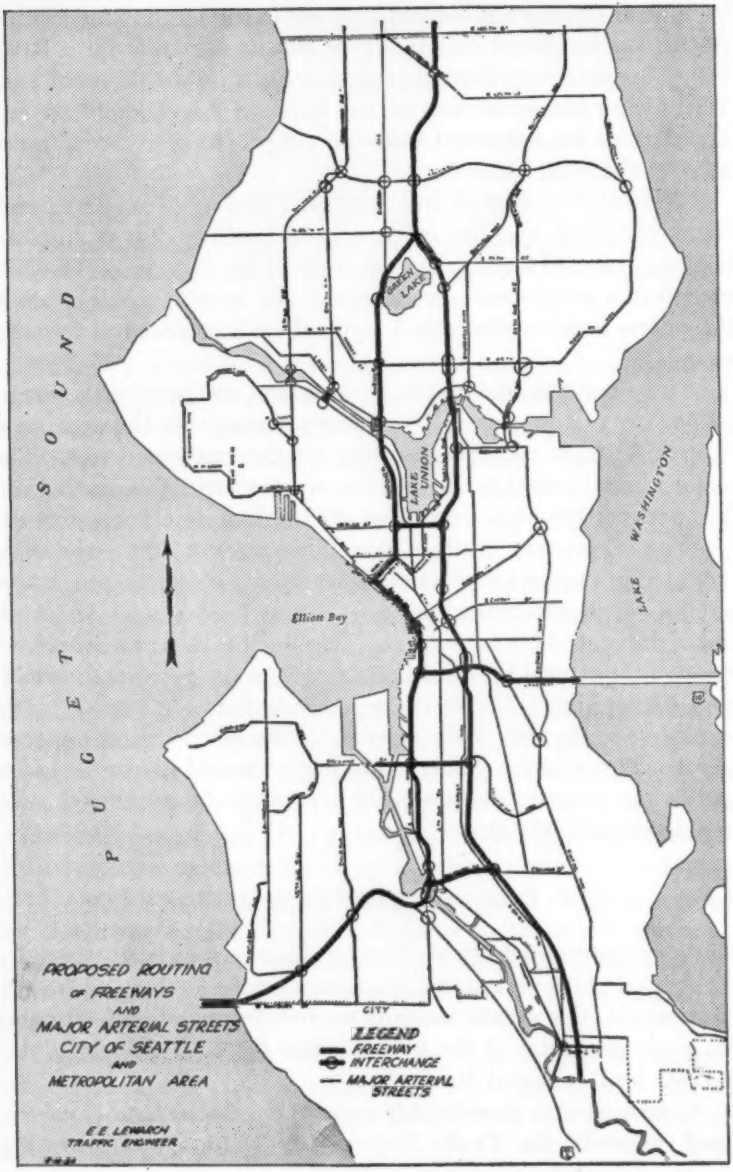
The major residential area is situated on a series of hills extending to the north and east of the central business district with the largest portion of the area located north of the ship canal. The hills extend in a north-south direction and rise to such a height above the valleys between that travel across them is impractical in many places.

These features of topography and land use restrict the major traffic flow to a north-south movement throughout the area, with relatively minor volumes traveling on the east-west streets. The major arterial streets are designed to accommodate this north-south flow pattern; however, because of the original development of the facilities to serve the needs of mass transportation, the majority of these facilities provide ultimate connections with the four major arterial streets extending through the restricted area at the south end of the central business district. Inasmuch as these streets extend through the central business district itself, vehicles using the facilities are forced into conflict with large volumes of pedestrians crossing the streets in the core of the district. This conflict creates unnecessary delay for vehicle operators desiring to travel between locations outside the central district and for persons desiring to travel to or from locations in the central area.

Congestion Relief Imperative

The congestion and delay in the central business district, especially during periods of peak traffic movement, created a demand for the construction of new traffic facilities to provide congestion-free routes along the perimeter of the business area for vehicular traffic not destined for the central district.

As early as 1940 considerable support developed for a plan proposed earlier by the Traffic Engineering Division, to construct a


SOUND
PUGET
GREEN LAKE
LAKE UNION
LAKE WASHINGTON
Elliott Bay
CITY
PROPOSED ROUTING
OF FREEWAYS
AND
MAJOR ARTERIAL STREETS
CITY OF SEATTLE
AND
METROPOLITAN AREA
E. E. LEWARCH
TRAFFIC ENGINEER
LEGEND
FREEWAY
INTERCHANGE
MAJOR ARTERIAL STREETS

viaduct on Alaskan Way, along the western edge of the business district, which would provide a four-lane facility for the movement of by-passable traffic around the congested central area. Considerable additional support for such a plan was received during the early part of the war when Seattle experienced a large influx of workers as a result of tremendous expansion of airplane plants and shipyards in the area.

Restrictions on material and manpower during this period necessitated abandoning plans for viaduct construction and resulted in the improvement of existing surface roadways east of the central business district to provide additional street capacity for the greatly increased number of vehicles. With the cessation of hostilities and curtailment of defense production, the return of war workers to their homes did not occur in the numbers anticipated. The resultant population increase, accompanied by accelerated vehicle registration and an unprecedented growth in vehicle use, revived the consideration of plans for a viaduct along Alaskan Way and construction of additional high-type facilities to provide for the movement of anticipated increased vehicular volumes.

Origination and Destination Survey

Because of the topographical features and density of population it was reasonably certain that other routes than the proposed Alaskan Way route would serve a large volume of Seattle's vehicular traffic. A thorough knowledge of the travel habits of the driving public as well as a consideration of land use and topography was necessary to determine the location of a route or routes which would serve the city's transportation requirements. Solutions to the problems of route location, as well as those involving facility capacity and interchanges, required information only obtainable from a comprehensive origin and destination survey.

To obtain the required information the Washington State Highway Department, in cooperation with the City of Seattle and the Bureau of Public Roads, conducted a comprehensive survey in the Seattle metropolitan area during the summer of 1946. Trained interviewers obtained information on an average weekday's travel

performed by all members of the 8,800 dwelling units which comprised the 5 percent sample selected for interview in the area. Similarly, information was obtained from 2,280 truck drivers and 180 taxi drivers, representing 20 percent and 50 percent respectively of all trucks and taxis having registered addresses within the metropolitan area. Traffic interviewers at seventeen stations established on the principal state and county roads, bridges, and ferries entering the metropolitan area obtained trip information from 62 percent of the 100,000 vehicles which entered and left the Seattle metropolitan area daily.

Appropriate expansion of the samples obtained in these interviews developed a total of 934,000 trips which began or were terminated in the Seattle metropolitan area on an average weekday. Approximately 50 percent, or 469,000, of these trips were made by auto, truck or taxi drivers.

The driver trip information obtained in the survey was then used for the assignment of vehicular traffic in the analyses of routes which had been proposed at seven different locations in the city. As a result of these analyses a system composed of the interconnection of four of the routes analyzed was recommended for ultimate construction to form a freeway system to serve Seattle's transportation needs. It was further recommended that the first stage of the freeway system should be the construction of a freeway type of facility on a route which would include a viaduct on Alaskan Way along the western edge of the central business district.

Alaskan Way Viaduct Construction

Detailed analysis of the Alaskan Way viaduct route indicated a need for a six-lane facility with an interchange to provide access to and from the viaduct at a point approximately midway between the north and south boundaries of the central business district. In addition, interchanges were recommended at the north and south boundaries of the central business district and at points approximately one mile to the north and south of the district.

Trip assignments indicated a volume of some 60,000 vehicles per average weekday could be expected on the viaduct adjacent to

Seattle Times Photo

Aerial View of Alaskan Way Viaduct looking in a southeasterly direction

City of Seattle Engineering Department Photo

Looking North on Alaskan Way Viaduct

the central business district if the facility were constructed as a freeway from the north to the south city limits and interchanges provided as recommended. The study also showed that lack of access to and from the midpoint of the central business district would reduce the daily volume on the viaduct to an estimated 32,000 vehicles and thus reduce the ability of the freeway to provide for Seattle's transportation needs.

Further analysis, necessitated by contemplated stage construction of portions of the Alaskan Way Viaduct route, indicated that a daily volume of some 25,000 vehicles could be expected if the portion of the route along the edge of the business district were constructed without ramp connections to the central district and with surface connections to existing major arterial streets to the north and south of the district. The connections to surface facilities were to be attained from two two-lane ramps at each end of the six-lane facility. These ramps would ultimately provide access to the completed six-lane viaduct route at each end of the business district.

Design plans were prepared for such a viaduct and provisions made for the future extension of the viaduct to the north and south beyond these ramp connections at the termini of the existing structure. The provision for future construction of ramps to permit access to and from the viaduct at the midpoint of the central district was incorporated into the plans with properly designed acceleration and deceleration lanes on the viaduct to serve these future ramp connections.

A double-deck type of construction was decided upon with traffic routed northbound on the upper deck and southbound on the lower deck. This design permitted the construction of a six-lane facility on existing street area eliminating the need for costly condemnation of business property abutting Alaskan Way adjacent to the freeway route. The design also made possible direct connections to the ramps giving access to the central district, thus eliminating the need for a costly, intricate cloverleaf type of interchange to provide such access.

Construction of a reinforced concrete viaduct was started in 1950 and the completed facility was opened to vehicular traffic in 1953. The double-decked structure, 7,660 feet long, consists of two

40-foot roadways providing for one 12-foot lane and two 14-foot lanes in each direction, a design which conforms to Bureau of Public Roads standards for structures on the Interregional Highway System.

The upper deck is illuminated by high-pressure horizontal mercury vapor lighting units mounted on steel poles at a height of thirty feet above the roadway. These units provide an average illumination of 1.0 foot-candle on the roadway surface. The lower deck is illuminated by fluorescent type lighting units mounted on the lower side of the upper deck which provide an average illumination of 1.7 foot-candles on the surface of the roadway. The design of this lighting installation conforms to the standards for street and highway lighting established by the Illuminating Engineering Society.

An area has been provided on each deck of the viaduct for the storage of stalled vehicles off the traveled portion of the roadway. In addition, telephones are installed at 1000-foot intervals on each deck to provide instant communication with the police department switchboard whenever conditions on the viaduct require the immediate dispatching of emergency equipment to that facility.

Overhead directional signs are provided on the approaches to the viaduct and on the viaduct itself. The signs which will be retained in the ultimate development of the viaduct route are of sufficient size to provide lettering adequate for the legibility distance required for designated speeds of the portion of the facility on which they are posted. The legends are formed by black lower-case letters on white opaque plexiglass background, illuminated at night by fluorescent tubing located behind the plexiglass. All signs are mounted overhead either at the side of the roadway or on sign bridges constructed over the roadway.

The total project cost of eight million dollars was shared equally by the City of Seattle, the State of Washington and the federal government.

Volume and Population Trends

Vehicular registration and population have increased markedly during the last fourteen years in Seattle and its suburban areas. Between 1940 and 1950 the population of the city increased from 368,000

persons to 463,000 persons, an increase of 25 percent. During the same period the number of vehicles in the city increased 60 percent, from a total of 125,000 vehicles registered in 1940 to a total of 204,000 vehicles registered in 1950.

In like manner the population of King County, of which Seattle is the county seat, increased 40 percent, from 505,000 persons residing in the county in 1940 to a total of 720,000 county residents in 1950. The number of vehicles in the county increased 68 percent, from a 1940 registration of 162,000 to a 1950 registration of 272,000.

These vehicular registration and population increases are reflected in the annual counts of vehicles crossing two cordon lines in the city. The variation of traffic volumes at these cordons are typical of the variation in vehicular traffic volumes observed on the major arterial street system. One cordon count measures the volume of vehicles traveling north and south across the five bridges spanning the ship canal and provides a complete measure of all traffic traveling between the north and south areas of the city. The other cordon count measures the volume of vehicles traveling north and south on the major business district streets at the midpoint of the central business district. The volume variation obtained from counts at this location accurately reflect the variations in volume observed on streets providing access to the central area.

Vehicular volumes traveling over the five canal bridges increased 27 percent, from a 24-hour average weekday volume of 129,000 vehicles in 1940 to an average weekday volume of 177,500 vehicles in 1950. During this same period vehicular volumes traveling north and south on major streets at the mid-central business district cordon increased 30 percent, from a 24-hour average weekday volume of 108,000 vehicles in 1940 to an average weekday volume of 140,000 vehicles in 1950.

Effect of Viaduct on Traffic Patterns

The trend of increase in vehicular volumes observed at the ship canal cordon lines between 1940 and 1950 continued through 1953, the year in which the Alaskan Way Viaduct was opened to traffic. In 1952 the volume of vehicles traveling over the canal bridges had

increased from the average weekday total of 177,500 vehicles measured in 1950 to a total of 188,000 vehicles, an increase of 6 percent during the two-year period.

During this period the construction of the Alaskan Way Viaduct necessitated the detouring of a substantial volume of traffic away from the construction area. This diversion of traffic resulted in a 1952 volume-decrease of some 11,500 vehicles from the 1950 volume of 32,000 vehicles measured on Alaskan Way at the central business district cordon line. The 1952 vehicular volumes measured on those streets passing through the central business district core at the cordon line showed no increase over the volumes observed in 1950, largely because the majority of the streets had reached their capacity during the periods of peak traffic movement. Thus a 24-hour average weekday volume of 128,500 vehicles was recorded in 1952 at the central business district cordon line and 102,000 of these vehicles traversed the streets passing through the core of the district.

After the opening of the viaduct in 1953 a total average weekday volume of 100,000 vehicles was recorded at the central district cordon, a decrease of approximately 20 percent from the 128,500 vehicles recorded in 1952. Also, a decrease of 16 percent was observed in the volume of vehicles passing through the core of the district, from 102,000 vehicles in 1952 to 85,000 vehicles in 1953.

The Alaskan Way Viaduct in its first year of operation carried approximately 10,500,000 vehicles, with an average annual daily traffic volume of 29,000 vehicles. Daily vehicular volumes traversing major central business district streets paralleling the structure were reduced an average of 20 percent, while peak hour volumes on these facilities were reduced 26 percent, from a peak hour total of 11,877 vehicles in 1952 to a peak hour total of 8,739 vehicles in 1953.

Development of the Freeway System

It is evident from studies of the effect of the Alaskan Way Viaduct on the traffic patterns of parallel surface streets that the development of the recommended freeway system will ultimately solve Seattle's transportation problems. By July of this year the second stage of development of the Alaskan Way Viaduct will be completed when

a 4-lane tunnel connecting the viaduct with a 6-lane expressway to the north is opened to traffic.

The tunnel extends a distance of 2,100 feet from the northern terminus of the viaduct structure, northeasterly beneath Battery Street to Aurora Avenue, the route of U. S. Highway 99 north from Seattle to the Canadian border. The tunnel consists of two 25-foot roadways permitting two lanes of traffic in each direction. It is illuminated by fluorescent luminaires which provide an average illumination of 7.5 foot-candles on the pavement at all times. During daylight hours additional lighting is automatically operated to provide a light intensity of 100 foot-candles at the tunnel entrances.

Ventilation is obtained by seventy-two axial flow fans capable of providing a complete change of air in the tunnel every two minutes. The ventilating system is designed to operate only when the carbon monoxide content of the air reaches a concentration of two parts per 10,000 and is controlled by a carbon monoxide sampler which continuously samples the air at eight locations in the tunnel.

Neon "Subway Closed" and "Detour" signs are mounted at locations north and south of the tunnel where vehicular traffic can be detoured as required by any emergency condition in the tunnel. These signs, as well as illuminated "Stop Motor" signs in the tunnel, are controlled manually from a central control room at midpoint of the tunnel. Emergency telephones at 325-foot intervals in both roadways of the tunnel provide direct connection with the control room or with the police department switchboard. An automatic, deluge type, dry pipe sprinkler system is installed to operate automatically in the event of a tunnel fire.

Cost of construction of the tunnel, about $3,000,000, was shared by the City of Seattle and the State of Washington.

Future Construction

The Washington State Highway Department and the Seattle Engineering Department are jointly programming construction projects that will upgrade Aurora Avenue, the northerly extension of the Alaskan Way Freeway route, from an existing expressway type of facility to a near-freeway type of design. Contracts for the construc-

tion of underpasses along this portion of the route, as well as for the extension of the freeway southerly approximately two miles and the construction of mid-town ramps will be let in 1955.

Construction of a freeway extending along the easterly edge of the central business district as a toll facility is being investigated by an engineering firm. This facility would be part of a toll road extending from Tacoma approximately thirty miles south of Seattle to Everett approximately thirty miles north. Preliminary location and geometric design of this facility have been completed by state highway and city engineering department design engineers. These plans contemplate a four-lane facility along the part of the route outside the Seattle city limits and an eight-lane facility in the part extending through the city.

Regardless of the feasibility of toll-road operation of such a freeway, the facility will ultimately be constructed as funds become available, and the route will form the backbone of the Seattle Freeway System.

Transportation Planning in Houston

EUGENE MAIER

Mr. Maier, for six years associated with the Department of Traffic and Transportation in Houston, Texas, is director of the Department. A civil engineer and holder of a certificate from the Bureau of Highway Traffic of Yale University, Mr. Maier spent eight years in highway design and construction, and eight years in traffic engineering as consultant for Texas cities. He is a member of the Institute of Traffic Engineers, and a member of the Joint Committee on Uniform Traffic Control Devices; chairman of the subcommittee on channelization, chairman of the ITE committee on channelization, and chairman of the Highway Research Board committee on channelization. Mr. Maier also serves on the Highway Committee and on the Military Affairs Committee of the Houston Chamber of Commerce.

SINCE the end of World War II, traffic and transportation officials have been deeply involved in efforts to stay ahead of the flood of automobiles poured onto the streets of every city without regard to the ability of the street system to absorb the traffic densities that on the average have increased three-fold.

Traffic engineers have been staying ahead by "making better use of existing facilities"—by developing, as far as local politics and citizen attitude would permit, the full capacity of the existing street system. In general and through necessity, such traffic improvement programs have been effective in most of the larger cities throughout the country. Traffic accidents and congestion have been reduced in many instances and in others the rate of deterioration of the traffic problem has been stemmed.

The gains achieved, however, are no more than a "holding action" and this is no time for the traffic engineer to rest on his laurels, to bask in creditable achievement, or to be so submerged in the usual mass of daily traffic routine and trivia that he loses sight of the problems in the traffic battles still to be fought and, of course, *won*. In short, what plans have traffic engineers developed for the time not too far distant, when better use *will have been made* of existing facilities?

A rational projection of the transportation trends that have so clearly developed since 1945 indicates that the reckoning is much closer than many traffic engineers and public officials are aware of or at least willing to admit.

To date, in almost every metropolitan area, all major thoroughfares are operating at or beyond practical capacity. New facilities are used to capacity as soon as completed and new major thoroughfares and expressways are not being provided at the rate at which traffic is increasing. A look into the traffic future is even more distressing when it is recognized that the difference between *practical capacity* and *possible capacity* of traffic arteries is in the order of *10 percent.*

The only optimists in the urban transportation field today are those who come within Doctor McClintock's once quoted definition, "An optimist in transportation is a person who is uncertain of the future." The recital of these alarming and somewhat discouraging statistics—the upward trend in motor vehicle registration and use, the rapid decline of urban transit and the agonizingly slow program of urban thoroughfare and expressway construction—is not intended as a pessimistic attitude toward the whole problem of urban transportation; rather it is intended to point to the need for looking ahead and planning now for the difficult, but not unsolvable, transportation problems so close ahead.

Planning Requires Imagination

There is a real danger in procrastination on the part of public administrators and traffic officials who relegate tomorrow's transportation needs to a *long range* program which will be considered when a never-ending *immediate action* program is completed. When one considers the time required to plan, sell to the public, finance and construct an essential transportation system, today is not too early and tomorrow is too late to discuss the transportation requirements of 1965 and 1970.

Admittedly, looking and planning so far ahead is difficult and requires imagination. Today's planning may become obsolescent before the end product is realized. Nevertheless, looking ahead and planning now for an adequate transportation system will not only

hold construction costs to a minimum by preventing fundamental errors, but will stimulate and guide orderly urban development.

What are the basic ingredients of urban transportation planning? Fundamental data include:

Trends in motor vehicle registration and use
Trend in population by area
Trends in land use
Travel patterns of automobiles, trucks, taxis and buses
Travel patterns of persons
Trends in modes of transportation
Trends in shopping habits
Trends in transit operation and use
Trends in supply and demand of curb and off-street parking

Analysis of existing traffic facilities to include types of facilities (local streets, major thoroughfares, expressways and freeways) roadway widths, surface type and condition, intersection design, traffic capacities and traffic control devices and regulations

Influence of other forms of transportation (air, railroad and water) on the motor transport system

The data outlined above will provide the basis for determining present transportation requirements which may then be projected to any desired year, ten or twenty years hence. The assignment of existing and projected transportation requirements to existing and proposed transportation facilities will:

1. Disclose and measure deficiencies in the existing system
2. Locate new facilities which will be required
3. Assure the protection and acquisition of essential rights-of-way at reduced costs
4. Establish priorities for future construction programs
5. Provide the basis for traffic and construction designs
6. Establish construction and right-of-way costs
7. Relate expected revenues to total cost and suggest methods for financing deficits
8. Assure coordination of transportation planning with other governmental agencies concerned—state highway department, county, contiguous and near-by cities, and other legally constituted highway construction and operating authorities.

When this plan has been accomplished, the traffic engineer can embark on a practical and far-sighted course and face the future with satisfaction and a measure of peace-of-mind.

Traffic Planning in Houston

Houston's Department of Traffic and Transportation, established in 1947, has made satisfying progress toward solving immediate and pressing traffic problems. The department's program has been directed toward increasing the capacity of existing facilities by one or a combination of the following traffic engineering techniques:

- Elimination of curb parking at all hours
- Restriction of curb parking during periods of peak traffic flow
- Regulation of curb parking limits with parking meters
- One-way streets
- Modernization of obsolescent traffic signal controls
- Installation of new traffic signals
- Restriction or prohibition of turning movements at major intersections
- Regulation of bus operation to include routing, zones and stops
- Regulation of truck loading and unloading operations
- Elimination of angle parking
- Speed zoning
- Improved traffic signing
- Greater use of pavement markings, including lane lines, center lines and crosswalks
- Regulation and control of pedestrian movements, including the installation of pedestrian signal indications at major intersections
- Special control for high-accident locations
- Regulation and control of driveways serving abutting property
- Installation of modern street lighting

The traffic improvements which have been achieved were realized with minimum objection, obstruction, confusion and difficulty. The department has been granted full authority to establish all traffic regulations without any specific action on the part of the city council. The installation of the necessary traffic control devices establishes the desired traffic regulations. The council, of course, reviews action taken by the department where protests by citizens are filed.

By 1951, the department recognized that gains in traffic capacity were quickly absorbed by pent-up traffic demands not previously satisfied and by the increases in motor vehicle registration and use related to the rapid post-war growth of the metropolitan area. This

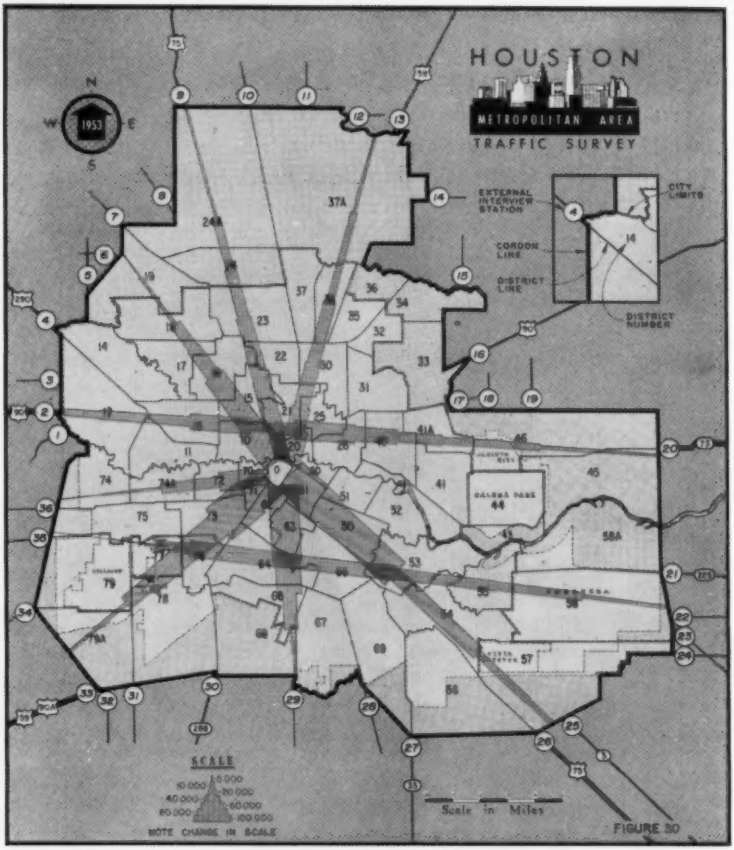


FIGURE 1. Major Desire Lines, all vehicle trips

growth and the development of related traffic problems are reflected in the following statistics:

1950–1952	Population in metropolitan area increased 21 per cent from	723,000 to 875,000
1950–1951	Area of City of Houston increased 100 per cent	80 sq. mi. to 160 sq. mi.
1946–1953	Motor vehicle registration in metropolitan area doubled	170,000 to 350,000
1946–1953	Annual transit riding decreased from	106,000,000 to 64,000,000
	Only 27 percent of persons entering Central Business District use transit.	

Aware of the developing problem, the department initiated action for transportation surveys which could provide basic facts required to develop a Master Transportation Plan for the Houston metropolitan area. In the summer of 1952, city council approved and appropriated funds for the following studies:

Metropolitan Origin-Destination and Parking Study. The cost of $155,000 was shared equally by the city and the Texas Highway Department.

Railroad Study for Houston. The cost of $51,500 was shared equally by the city and the railroads serving the city.

The Origin-destination and Parking Study

The origin-destination and parking study was directed by the planning survey of the Texas Highway Department in cooperation with the Department of Traffic and Transportation. The origin-destination survey was conducted by the home interview method for information on internal trips and by the roadside interview at the cordon line for external trips. (Figure I.) The final survey report has been published and the following is a summary of the more significant facts:

1. The metropolitan area selected for the survey included 315 square miles and seven incorporated cities located within the boundaries of the City of Houston.

2. The population in the survey area was 878,000 persons. A total of 2,216,929 vehicle and passenger trips were made in and

through the metropolitan area daily, of which 93 per cent had both termini within the area.

3. Vehicle trips accounted for 63 per cent or 1,397,219 of the total trips. Of 819,710 passenger trips daily, 30.8 per cent were made by bus passengers.

4. Of the 1,259,154 vehicle trips made wholly within the area, 12.6 per cent had either origins or destinations in the central business district. Vehicle trips making no essential stop within the survey area amounted to only six-tenths of one per cent of all vehicle trips.

5. 34.6 per cent of all bus passenger trips had origins or destinations in the central business district.

6. Commercial vehicle trips accounted for 16 per cent of all internal vehicle trips and 24.4 per cent of all external vehicle trips.

7. 23 per cent of all vehicle trips were intra-district movements.

8. Average passenger car occupancy for internal trips was 1.58 persons per car and for external trips was 1.9 persons per car.

9. There were 6.8 trips made per dwelling unit and 2.1 trips per person per average day by all modes of travel. This does not include trucks and taxi drivers.

Survey Data Analyzed

Data obtained from the origin-destination survey are now being analyzed by the Department of Traffic and Transportation. Zone-to-zone movements of all 1953 vehicular trips are being assigned to a network of proposed major thoroughfares and freeways. The travel-time ratio method is used for determining the percentage of traffic which may be assigned to freeway-type facilities. For the purpose of the analysis, it is assumed that major thoroughfares will be constructed to adequate standards by the time the freeway system is completed. Expected average speeds, therefore, are assigned to the major thoroughfares rather than existing speeds. The classification of speeds of the various facilities used in the analysis is as follows:

1. Freeways—45 mph
2. Major thoroughfares with widely spaced intersections and some access control—33.75 mph

3. Major thoroughfares—22.5 mph
4. Central business district streets—11.25 mph

These assumed speeds compare favorably with actual speeds as obtained from speed and delay studies.

The projection of the 1953 traffic assignments to the year 1975 is based upon a careful evaluation of growth and development trends in each separate survey zone. The Department of City Planning has cooperated in the project by providing population and land use trends in each of the survey zones. In developing 1975 zone populations, the city planning department has considered such factors as trends in population; dwelling units per square mile, persons per dwelling unit; areas occupied by residences, business, industry, public and semi-public agencies; projected uses of undeveloped land; and the social and economic level of residents. Data obtained were compared with similar data in each adjacent study area.

Trends in motor vehicle registration and use are based upon historical records relating to traffic flow, gasoline consumption and vehicle registration. The volume of generated traffic assigned to freeway-type facilities will be based upon studies conducted on Houston's Gulf Freeway.

The completed analysis of the origin and destination survey will provide the basis for the traffic design of the Freeway and major thoroughfare systems within the metropolitan area. Sufficiency studies are being conducted on the existing system of major thoroughfares which, when combined with the 1975 traffic requirements, will point to those locations where acute roadway deficiencies will develop and will provide the basis for construction priorities. The survey will also show for the year 1975 the construction and right-of-way costs for the transportation system and will point to the need for continuing adequate financing policies.

Railroad Study

In reporting on the results of the railroad crossing survey, the consultant stated that "Houston is confronted with a grade crossing problem unequalled in any other city of comparable size in the United States."

Six major railroads enter the city over fourteen different routes and two terminal railroads operate over additional routes in and around the city. There are 500 main-line grade crossings within the city limits, 150 of which are crossings of major thoroughfares. In addition to the main-line crossings numerous industrial spur tracks, team tracks and yard tracks extend across city streets. The number of these crossings has been estimated at 5,000.

Approximately 100 freight trains and 60 passenger trains operate over the main-line tracks in and out of Houston each day. Freight transfer and switching movements are relatively heavier because of the industrial development in the city.

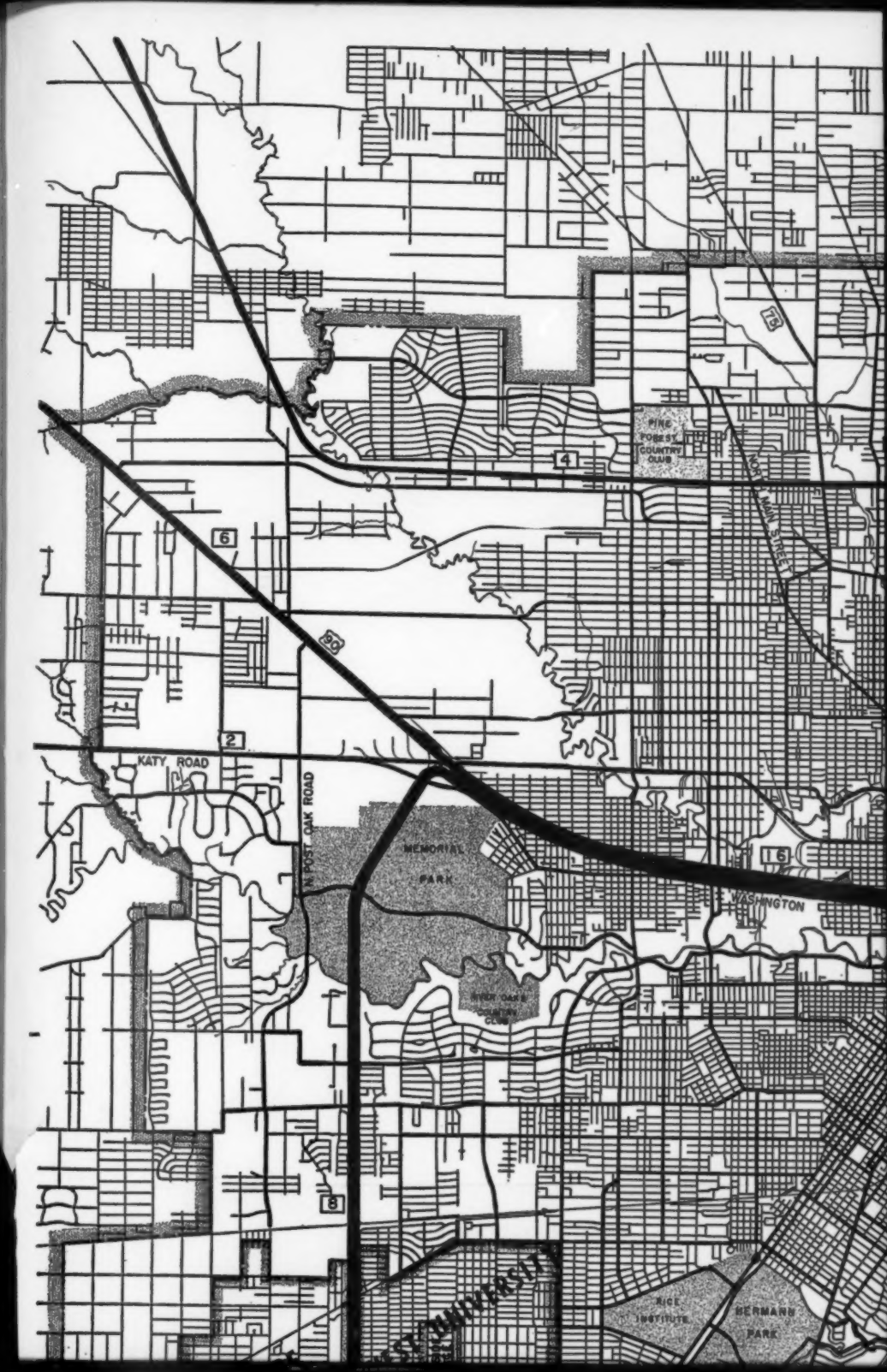
On the basis of the consultant's recommendation for relocation, abandonment and consolidation of rail facilities and for changes in rail operations, a suggested pattern of daily train movements was developed. The suggested total train movements for all railroads is shown in Figure II. The integration of the proposed pattern of train movements with the pattern of major thoroughfares and freeways being developed from the assignment of traffic from the O-D Survey will establish locations for railroad crossings, the types of structures required and the priority for construction.

The surveys conducted will provide the factual data for developing an intelligent and long-range thoroughfare and freeway program.

Traffic Control in Central Business District

In addition to developing plans for constructing major thoroughfares and freeways to serve the metropolitan area, the department has given special attention to traffic problems within the central business district. A major objective in the department has been the completion of a traffic control system that would assure accessibility to the central business district and development of full capacity of all streets within that major area of business and retail trade.

In 1948 the department established twenty-two miles of one-way streets within, and on, the approaches to the central business district. The traffic control plan for the central area is being completed with the addition of thirteen miles of one-way streets and by modernizing the traffic signal system in the central business district. This project will be completed during 1954.


PINE FOREST COUNTRY CLUB
MAIN STREET
KATY ROAD
N POST OAK ROAD
MEMORIAL PARK
RIVER OAKS COUNTRY CLUB
WASHINGTON
SOUTHAMPTON
RICE INSTITUTE
HERMANN PARK
75
45
610
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59
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13
JENSEN DRIVE
MAIN STREET
14
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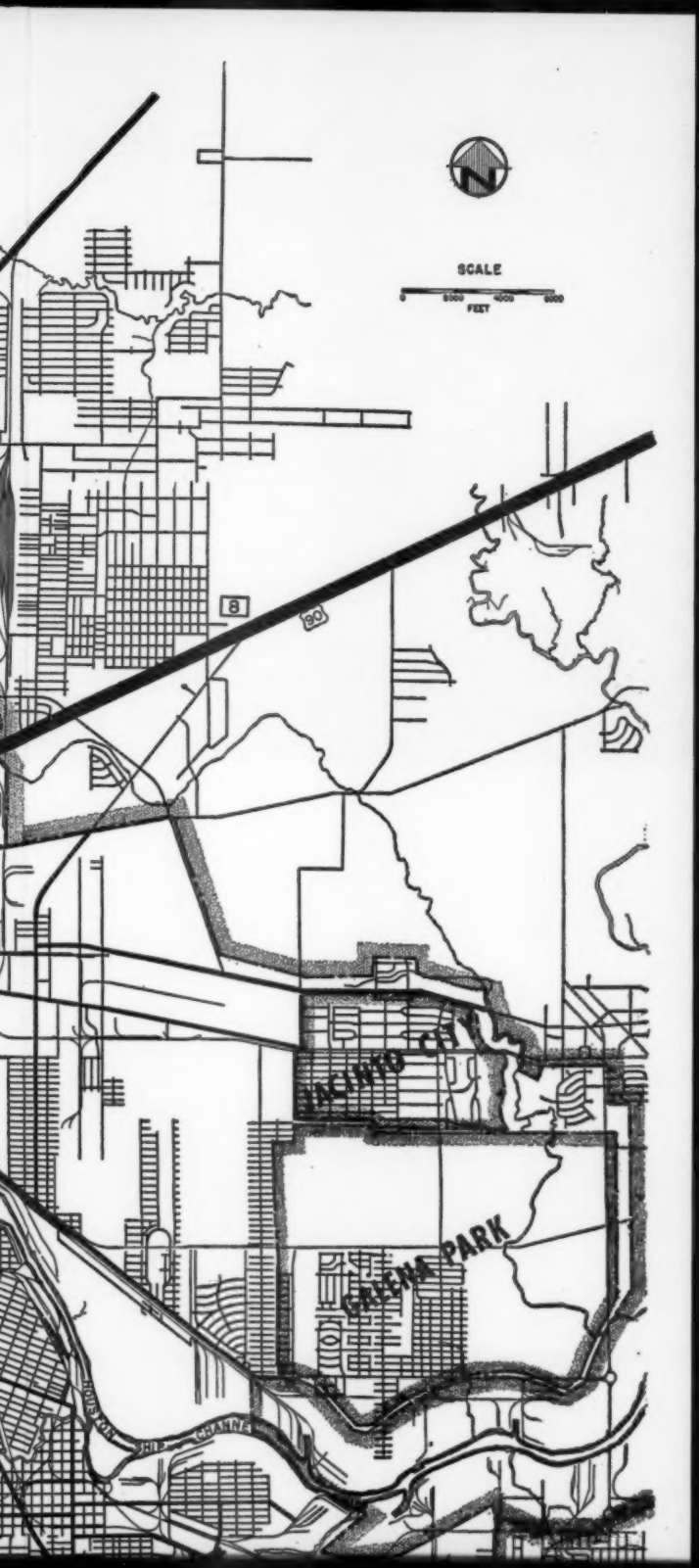
WAYSIDE
HOUSTON COUNTRY CLUB
FOREST PARK CEMETERY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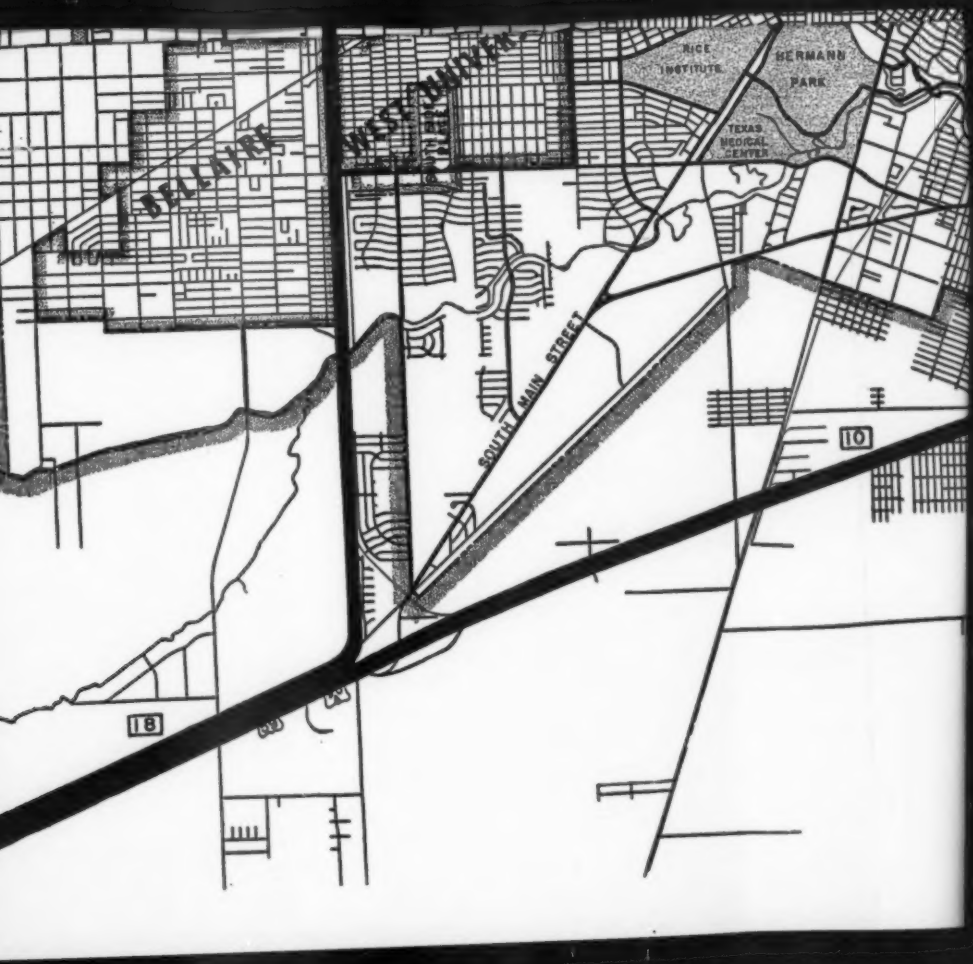
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TEXAS MEDICAL CENTER
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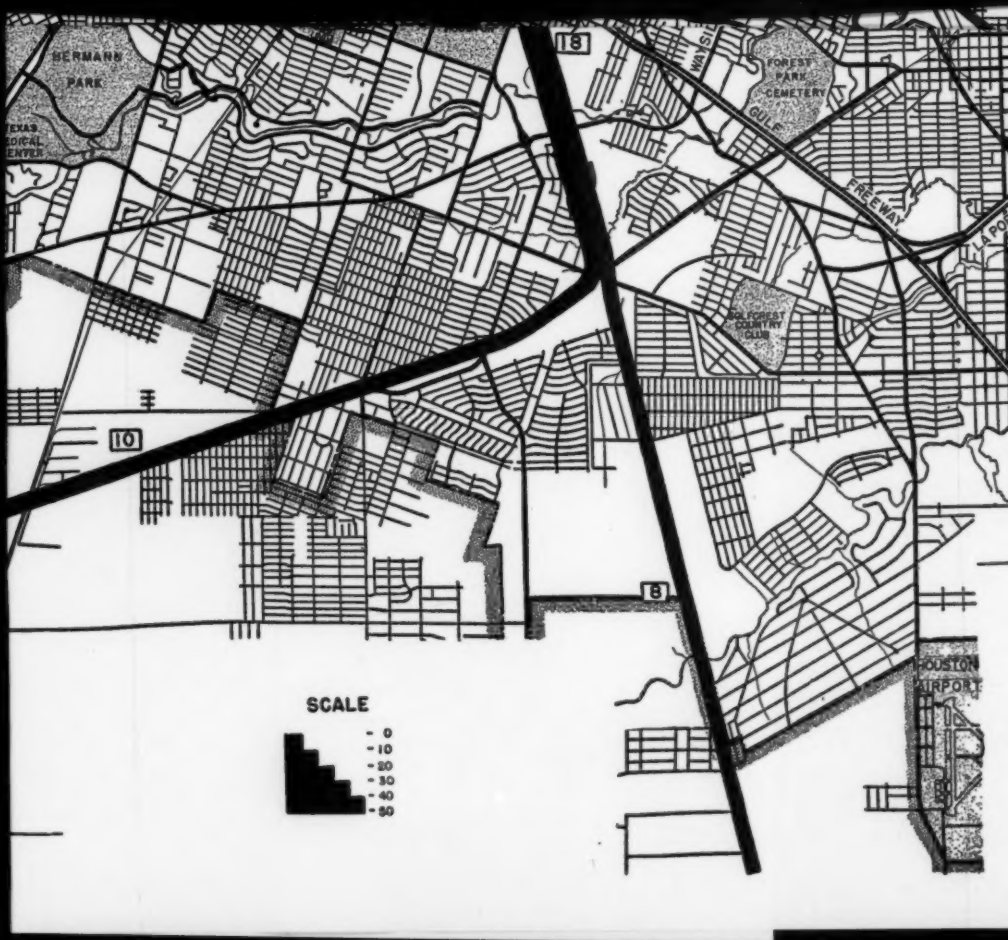
HERMANN
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HOUSTON, TEXAS

SUGGESTED PASSENGER TRAIN MOVEMENTS ALL RAILROADS

MAXIMUM DAILY TRAFFIC PER ROUTE

DE LEUW, CATHER & COMPANY
ENGINEERS
CHICAGO

The signal system in the central area includes controls at 135 intersections. A variable frequency system being installed will provide for automatic cycle and off-set selection based upon traffic density within the central area. Roadway detectors will sample the traffic flow and will determine the most efficient cycle and method of signal timing. No preference is given to any directional movements and full capacity of all streets is developed. During the off-peak periods, progressive traffic flow will be established on all one-way streets at speeds varying from 16.5 to 22 mph. Speeds will vary with traffic density and will be obtained with cycle lengths of 40 to 55 seconds and with off-sets amounting to one-fourth cycle between intersections.

During periods of peak traffic flow, simultaneous signal timing will be employed and the cycle will be extended between the limits of 70 to 90 seconds, depending upon the traffic density. As the blocks become filled with vehicles from parking lots and garages, all traffic on a street must move simultaneously or none can move. Under such conditions of traffic, any attempt to develop progressive traffic movement will reduce street capacity because of the intersection blocking and frequent stopping that will develop.

The signal system in the central business district is interconnected with the signal system on the feeder streets to the Gulf Freeway. This system includes ninety-seven signalized intersections. An additional fifty-seven intersections on the streets south of Gray are also interconnected to the master control system.

The system of one-way streets, efficient traffic signal controls, assignment of adequate bus and truck zones, elimination of left turns at signalized intersections on two-way streets, and prohibition or restriction of curb parking particularly during hours of peak traffic flow will assure maximum practical capacity on all streets within and leading to the central business district.

Study Reveals Parking Needs

In connection with the origin-destination survey, a parking study was conducted for the central business district comprising an area of 150 square blocks. Although enabling legislation has never been enacted by the State of Texas which would permit cities to acquire,

construct and operate off-street parking facilities, the parking study is of greatest importance as an aid to development of parking facilities by private enterprise.

The study revealed 19,130 parking spaces within the survey area, 3,615 at curbs, 9,803 in lots, and 5,712 in garages. A total of 51,298 vehicles use these facilities daily with 47.5 per cent parking in curb space, 36 per cent in lots, and 16.5 per cent in garages.

It is interesting to note that although streets in the business district are wide, only 40.7 per cent of the available curb space is assigned to parking. The remainder is required for special zones and for prohibited parking locations.

Since 1947, six parking garages have been built in the central business district with total capacity of 3,350 spaces. Two mechanical garages with a combined capacity of 850 stalls are now under construction. The parking study will assist private enterprise in determining demands for and location of essential off-street parking facilities required to support business activity in the central business district.

Summary

Trends in the field of urban transportation clearly point to problems which lie ahead. Traffic engineers and city officials responsible for traffic control and traffic planning cannot rationalize their responsibility in the hope of a future leveling-off period. Immediate problems of traffic regulation and control must be recognized and solved, but at the same time planning must be sufficiently far-sighted to assure development of those urban transportation facilities which will be required during the next two decades. If we do not plan now, opportunities now at hand to provide for essential transportation facilities will disappear and future administrators will be faced with overwhelming difficulties. Salvation lies in sound traffic and transportation planning.

Buffalo Parking Plan

WELLES V. MOOT

Mr. Moot has been chairman of the Board of Parking of the City of Buffalo since its creation early in 1952. For the previous nine years thereto he was chairman of the Buffalo City Planning Commission and for many years has been a director of the City's Planning Association. He was for years a director and vice-president of the American Society of Planning Officials. Mr. Moot is a practicing attorney, a member of the New York State Board of Regents, and has various corporate responsibilities.

PARKING problems in the main business areas of Buffalo are not substantially different from the problems of any metropolis of the same size. The short-time parking required for shoppers, to sustain the vitality of the main business area, is similar to the needs of other cities. It would serve no useful purpose to repeat here the pattern of Buffalo studies with reference to these needs, for that pattern also follows those of other urban communities and has been often reviewed.

Migration of business from Buffalo's down-town business district to outlying areas started ten or fifteen years ago and the City Planning Commission and down-town merchants have been fully conscious of the steadily increasing threat to the down-town business area and, as a result, to the city's tax income. Many suggestions to remedy the situation were made during the preceding ten years.

One of these suggestions was the creation of a parking authority with power of condemnation, issuance of bonds, etc. However, the state legislature was strongly opposed to any more parking authorities because they had too frequently been used to avoid the tax limits set up by the state constitution. Also some of the business groups tried to acquire tracts adequate for parking purposes close enough to the stores for satisfactory shopper-parking but in every instance the lack of the power of condemnation, and extravagant demands by property owners stymied their attempts to provide such parking by shoppers.

The Buffalo plan is interesting, not because of its similarities to

other methods of solving parking problems, but because of its differences. The basic purpose of the Parking Board of Buffalo was to keep the city out of business and to solve the short-time parking needs of shoppers in the down-town areas through private enterprise rather than government or quasi-government authority operation.

The first step taken to accomplish this was by obtaining state legislation permitting the city to waive taxes on new parking structures for fifteen years while collecting taxes on the land values. This was intended to help make it possible for private industry to develop additional parking facilities for shoppers. It was believed that such temporary assistance was necessary because the high cost of construction of parking facilities today, with full taxation on the cost of the structure, both in theory and during ten years of experience, had prevented the construction of any new down-town garages.

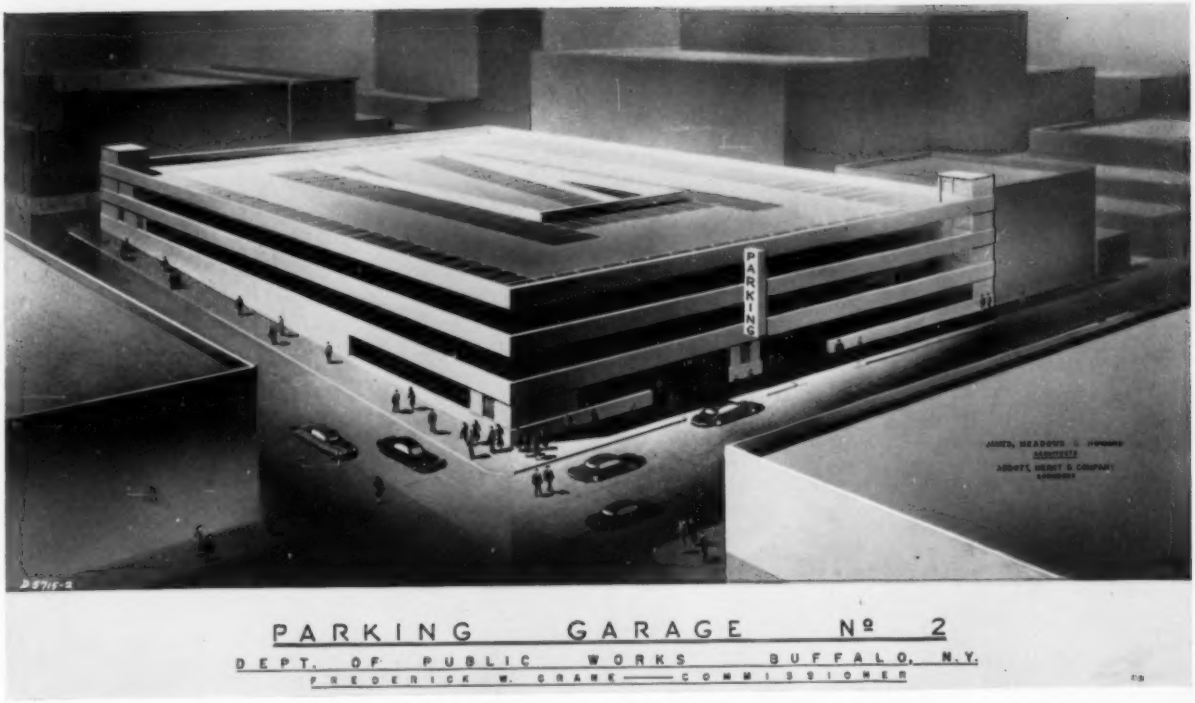
How the Parking Board Works

The major effort of the parking board was to help down-town merchants solve their problem of adequate short-time parking for shoppers by using the city's power of condemnation and the city's high credit and low interest rate to finance the acquisition of sites and the construction of garages. It could then turn over to the down-town merchants, through a corporation to be formed by them, the operation of these new garage facilities.

It was the belief of the parking board that these garages could best be operated by such a corporation formed and controlled by the down-town merchants, the efforts of which corporation would always be co-ordinated with the needs of the shopping public and the down-town stores through the self-interest of the down-town merchants.

The idea was that the merchants would put up sufficient working capital to assure the successful operation of these down-town garages and that the contract for garage operation would be on such a basis as to assure to the city payment of interest on the bond issues and retirement of the bonds in less than thirty years, together with an adequate sum to cover the taxes which might have been expected from this property if privately owned. It was also contemplated that this contract for the operation of these garages by the down-town mer-

One of three downtown parking garages under construction in Buffalo.



Buffalo's parking garages will be operated by the merchants' corporation.

chants would be on a nonprofit basis and that the contract would be so drawn that any surplus income over and above expenses would eventually come to the city to be applied on the payment of the bonds and interest.

The city was also to retain control over the parking charges and the operating expenses of the parking corporation to assure that the indicated objectives were carried out and the public interest was best served. As an added precaution the city reserves the right at any time after five years to cancel the contract and make other arrangements for the operation of these parking facilities.

To summarize our arrangement here in Buffalo; through the use of the city's power of eminent domain and its high credit and low interest rate on its bonds, the construction and operation of these parking facilities are made possible under the most favorable terms; the merchants are undertaking to operate the project on a nonprofit basis thereby assuring the shopping public that charges for parking will be as reasonable as possible while at the same time making it as certain as can be that the interest on the bonds and the principal of the bonds will be paid off out of the earnings of the parking facilities; the city will receive a reasonable return in lieu of taxes, and also, not later than the end of the thirty-year period, the city will own these garages fully paid for and clear of all indebtedness.

Progress Under the Plan to Date

A careful engineering study of three selected down-town sites indicates that they will be self-supporting and self-liquidating with a reasonably substantial margin of safety. The proposed contract has been negotiated with the merchant-group and the merchants' corporation has been formed. The sites of the three down-town garages have been acquired, the bond issue has been sold at a two percent interest rate and condemnation of the sites completed and demolition authorized. The plans for the garages themselves have been approved and can be submitted for bids shortly. Since the lease contract is a long-term contract it has to be offered for bids and that has been done. But since the basis of the lease is a nonprofit operation, it is anticipated that only the merchant-group will be willing to put

up the three hundred thousand dollars required for working capital and operate on a nonprofit controlled basis called for by the contract.

Construction of these garages will probably be under way this summer and upon completion they will be turned over to the merchants' corporation for operation. If this method of private operation backed by the city's power of condemnation and low interest rate on city bonds proves to be successful, then any future needs for additional shopper-parking in the down-town area can be handled on a similar nonprofit private enterprise basis with the merchants and the city cooperating to further their mutual interests by providing needed shopper short-time parking and thereby relieving down-town traffic congestion.

In the Broadway-Fillmore parking area, the Broadway market is being rebuilt with parking facilities on the roof of the market structure, and the Broadway-Fillmore merchants are entering into a similar contract with the city governing the operation of this parking facility.

The parking board is also engaged in planning the development of parking lots on a similar cooperative basis in various smaller shopping areas in other sections of the city.

Express Bus Service on Freeways

STUART MILL BATE

Mr. Bate is chief engineer of the Los Angeles Metropolitan Traffic Association, a non-profit organization whose specific purpose since 1922 has been to develop comprehensive plans for improvement of traffic facilities in the Los Angeles Metropolitan Area. His more than fifty years' work has been in the fields of railroad facilities, bridge and building construction, traffic and transportation plans and studies, and in charge of such work for the consulting firms of Charles E. Smith and Company and Harland Bartholomew of St. Louis, Mo. He is a registered engineer in California and a member of the Institute of Traffic Engineers.

IN 1938, citizens and officials of the Los Angeles Metropolitan Area faced the problem of record increases in population and its consequent street, highway and transit congestion. To formulate definite plans for accomplishing improvements, a Citizens Transportation Survey Committee was organized to sponsor an exhaustive survey of traffic and transportation.

This survey was directed by a transportation engineering board officially constituted under governmental authority. Two reports were prepared and published—"Report of Traffic and Transportation Survey" and "A Transit Program for the Los Angeles Metropolitan Area." The parkway, or freeway plan, recommended in the latter report was approved and adopted by the City Planning Commission in 1941. It was accepted, practically as published, by the state highway authorities and is now well under way as shown by the accompanying map—Master Plan of Freeways.

Recommendation No. 1—Non-stop arteries are required with direct routes permitting adequate overall speed for private and public passenger vehicles over long-haul and inter-district trips.

Recommendation No. 2—The substantial investment incurred in providing grade-separated traffic arteries requires intensive use to justify actual construction. The further comment was made that "if only five out of every hundred vehicles on an express highway are buses, the effect of their greater capacity and more practical

loading is to more than double passenger-carrying service performed by the highway, at the same time greatly reducing the travel time of the substantial number of persons benefited by the rapid transit bus service."

Following the original Transportation Engineering Board of 1938, the Los Angeles Metropolitan Parkway Engineering Committee was formed in 1944 to develop the freeway program in this area. It was composed of city and planning engineers of the City of Los Angeles, the county and cities immediately adjoining Los Angeles. Early in 1946, when the state legislature's Joint Fact Finding Committee on Highways, Streets and Bridges was making its studies of the highway situation in California, this Parkway Engineering Committee was expanded to include engineering and planning representatives from all the cities within the country and representatives of the state division of highways. A system of freeways for the metropolitan area within Los Angeles County was approved and officially submitted to the Joint Fact Finding Committee on March 30, 1946.

In 1950, the Parkway Engineering Committee was reconstituted as the Metropolitan Transportation Engineering Board and has been active ever since in the promotion, development and acceleration of our freeway needs. It is still a voluntary group of officials working cooperatively to accomplish a job for the well-being of our entire community. It adopted a two-year program in July, 1953, consisting of two parts: Part one included 61.7 miles of acquisition and construction on nine of the freeways as approved in the previously adopted freeway plan. Part two included 177.5 miles on eleven freeways of the previously adopted plan, resulting in a system of 239.2 miles under the program.

It has been determined that at a reasonable rate of progress over the ten-year period, 200 miles of the above 239.2 miles will be ready for bus operation. Of this 200 miles, 52 miles are now completed.

Economy of Freeways

The economy of freeways has been discussed and largely authenticated by numerous studies and tests by individuals and companies. Freeways for the use and potential use of automobiles and buses are

increasingly indicated—the bus finally becoming necessary to meet the automobile-created conditions. One fully loaded bus carrying about sixty people bears the same load as forty private automobiles with one and a half persons per vehicle in the Los Angeles Area.

Checks of passengers moving in one direction on busy city streets during the hour of maximum travel disclosed that units must be spaced 200 feet apart to move 6,000 passengers. On the freeway, only a single lane of travel with the units spaced 2,300 feet apart need be used to move the same number of persons during the hour of maximum travel; and since the units are not delayed by stop lights and cross traffic, they can move about eight times faster. In addition to the benefit of reduced travel time, the dollar savings would be reflected in fares on improved service.

This does not mean that in all cases the units will always move through the central district where the check was made uniformly at 200 feet spacing. They will be governed by the traffic lights and other delays which are not timed for such conditions.

Spacing of vehicles on ordinary city streets outside the central business district depends upon the character of the line on which they operate, the schedules in force at particular times of day, the number of vehicles assigned to a particular line as well as the vagaries of the individual drivers of vehicles.

Again several lines operating on the same street in the downtown district produce the headways necessary to move the 6,000 passengers in one direction during the maximum hour. When the units leave the central area, however, and disperse upon their several ways on separate streets, the headways are materially changed.

While we do not presently have any line operating exclusively on a freeway, a comparison of lines 94, the West Hollywood Line, and line 69, the Hellman Avenue Line, will serve to illustrate the advantage of freeway operation over that upon an ordinary city street. Line 69 operates between downtown Los Angeles and Fremont Avenue over the Ramona Freeway. From there to the outer end of the line at Walnut Grove Avenue it follows Hellman Avenue. Because of its operation on Ramona Freeway of 62½ percent of its total length, we can base Line 69 schedules on a speed of 18.65 miles per hour. Line 94, approximately the same length but operating for

its entire length upon an ordinary city street must be based upon a speed of 11.78 miles per hour, a difference of 6.87 miles per hour in favor of line 69.

These 6,000 passengers would require 90 buses with a seating capacity of 50 passengers and so loaded that only 25 percent of the passengers would be standing at the peak load point. The average time between buses would be forty seconds or two-thirds of a minute. If they are traveling in one direction in one lane of a multi-lane freeway at 40 miles per hour, the average distance separating them would be 2,300 feet or over four-tenths of a mile.

The automobile capacity of three entire lanes of a freeway in one direction has been estimated at 4,000 per hour (1,500 plus 1,500 plus 1,000 in the outside lane which handles merging traffic). At the usual occupancy rate of 1.5 persons per automobile this would be 6,000 persons per hour.

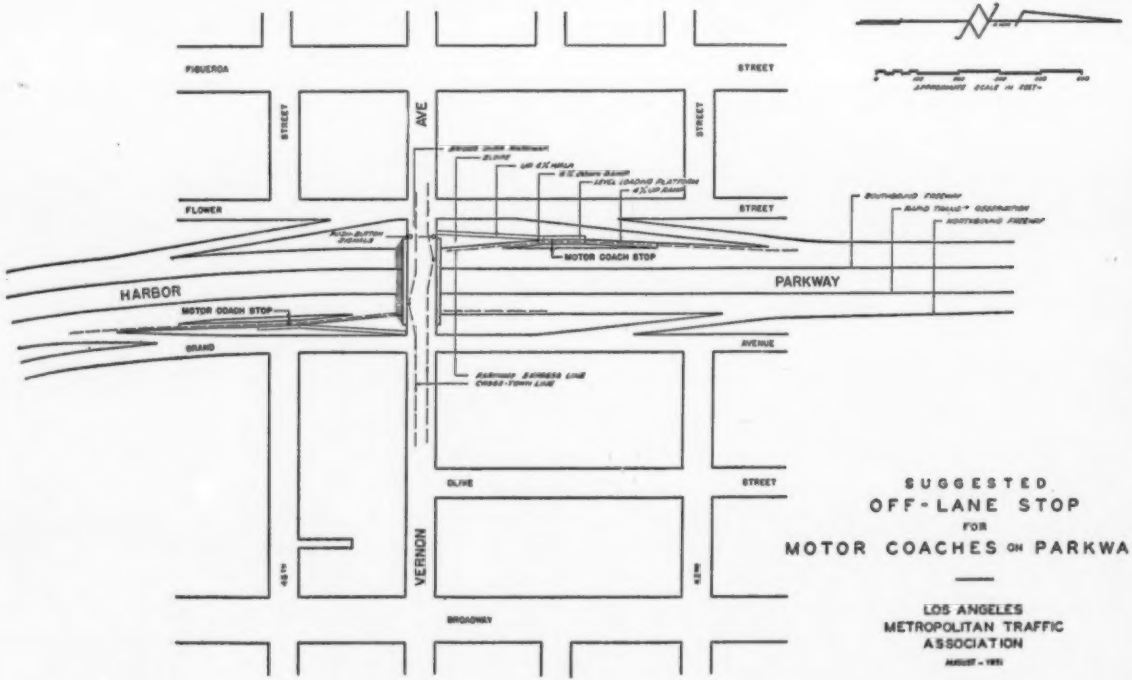
The best that is being accomplished on an ordinary city street at present in Los Angeles is 12 miles per hour or five minutes for each bus to make a mile. Actually it requires so many buses to carry the peak loads on our city streets that they are often seen bumper to bumper on many of the lines.

It has been determined that by speeding up traffic so that mass transit vehicles could move just one mile per hour faster, savings in operating cost approaching one million dollars per year could be realized by the operators. It has also been determined that a bus operated on a freeway averages for operators' wages 9.86 cents per mile traveled as compared with 14.57 cents per mile on a city street, a difference of 4.71 cents per mile.

Rail Rapid Transit Studied

In many studies of our parkway or freeway system, suggestions have been made for rail rapid transit on the freeways.

A board of consultants was employed by the City of Los Angeles in 1945 to review the traffic and transportation plans and programs of the Los Angeles Metropolitan Area. They recommended rail rapid transit operations on the Hollywood, Santa Monica, Olympic, Harbor, and East By-Pass. Increasing the width of a freeway so as to



SUGGESTED
OFF-LANE STOP
FOR
MOTOR COACHES ON PARKWAYS

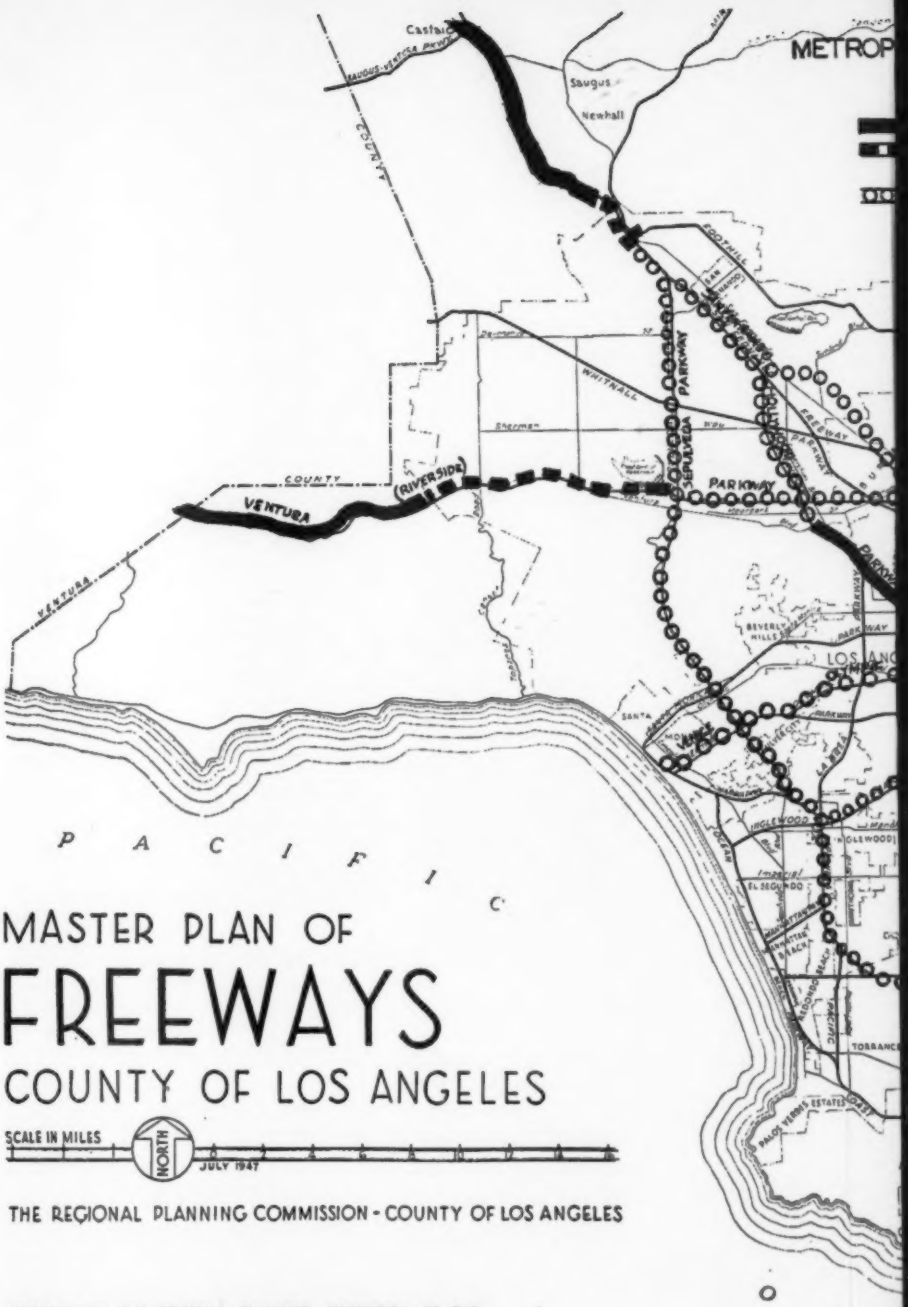
LOS ANGELES
METROPOLITAN TRAFFIC
ASSOCIATION

provide space for rail rapid transit in the center mall may be estimated to add approximately one-sixth to the cost. This additional cost includes not only the greater width of right-of-way but also additional excavation and increase in length of bridges. Based upon policies adopted on similar projects elsewhere it may be assumed that all costs over and above those involved in development of freeways of the normal type must be financed out of funds other than those supplied by the state highway department or the Federal Public Roads Administration. The total cost of widening all freeways proposed for rail rapid transit as thus estimated, amounts to approximately $23,000,000.

Also a substantial investment is required for rapid transit stations and for fixed transit equipment including track, signal, power and other facilities necessary to high speed operation. For the entire system recommended, it is estimated that these facilities would require an investment of approximately $30,000,000. The underground terminal proposed under Broadway is estimated to cost an additional $15,000,000, thus bringing the capital investment to complete the rail rapid transit system to approximately $68,000,000.

While these recommendations come up from time to time, the fact that the Hollywood Freeway is practically completed and the Harbor Freeway well along without provision for rail rapid transit probably means nothing will come of it. Even when the opportunity was present on that portion of the Hollywood Freeway through Cahuenga Pass where a double track electric railway occupied the central section of the freeway right-of-way, the rail facilities were abandoned in favor of additional freeway lanes in each direction.

Express bus operation on freeways provides express type service to much larger areas than any fixed facilities in low density population cities like Los Angeles. All engineering analyses of transit proposals have found that density of population in this area will not justify high speed and high capacity trunk rail lines for any but the most heavily populated areas, and that very extensive feeder bus lines would be necessary to make the trunk lines serviceable. The greater part of the metropolitan area will continue to depend on the bus and private automobile even if money can be found to finance rapid transit regardless of what type of mass rail rapid transit is pro-



MASTER PLAN OF
FREEWAYS
COUNTY OF LOS ANGELES

SCALE IN MILES 1 0 1 2 4 6 8 10 12 14 16

NORTH

JULY 1947

THE REGIONAL PLANNING COMMISSION - COUNTY OF LOS ANGELES

ADOPTED BY THE REGIONAL PLANNING COMMISSION OF THE LOS ANGELES COUNTY REGIONAL PLANNING DISTRICT, STATE OF CALIFORNIA, AUGUST 6, 1947

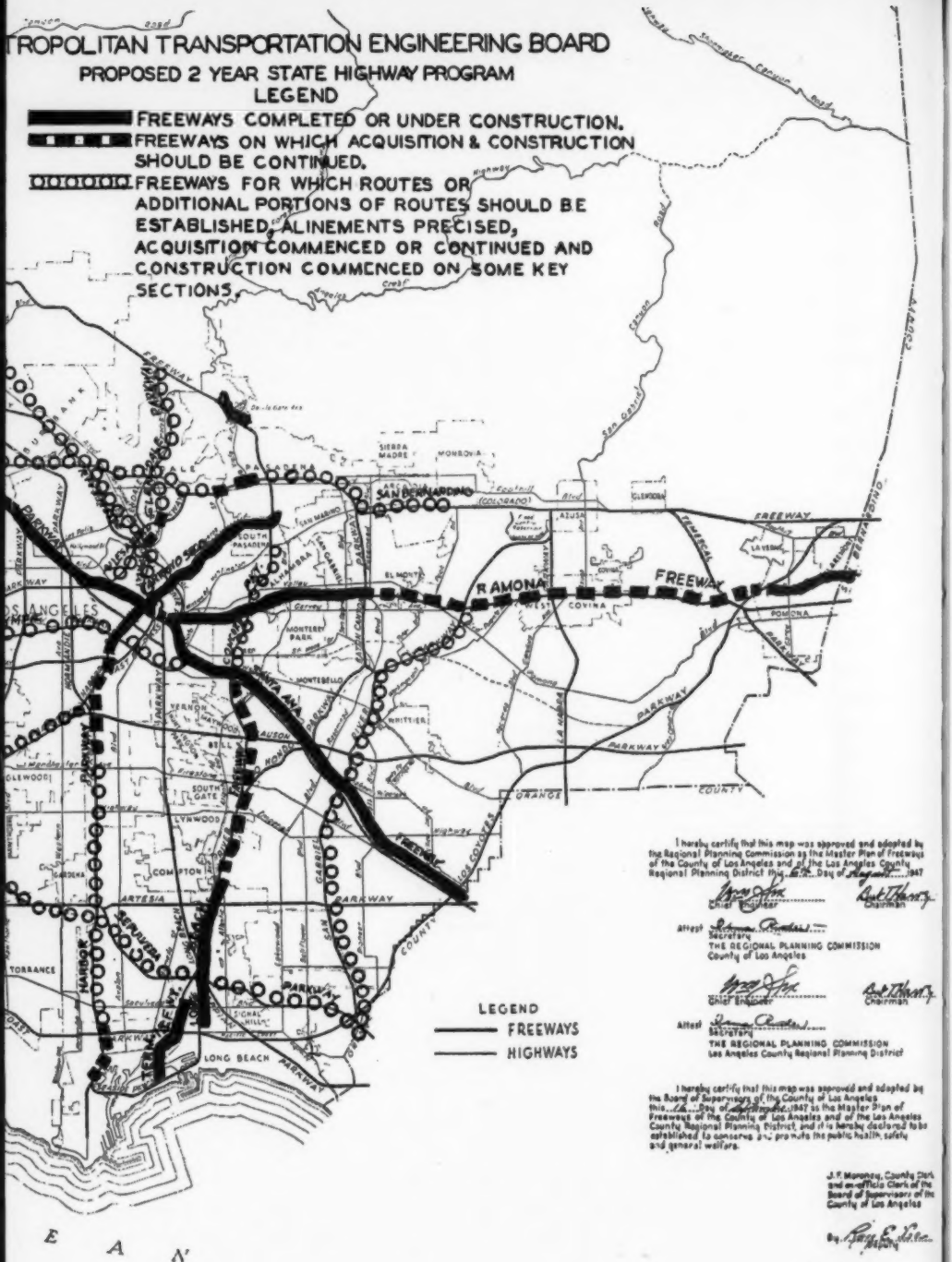

TROPOLITAN TRANSPORTATION ENGINEERING BOARD
PROPOSED 2 YEAR STATE HIGHWAY PROGRAM
LEGEND
FREEWAYS COMPLETED OR UNDER CONSTRUCTION.
FREEWAYS ON WHICH ACQUISITION & CONSTRUCTION SHOULD BE CONTINUED.
FREEWAYS FOR WHICH ROUTES OR ADDITIONAL PORTIONS OF ROUTES SHOULD BE ESTABLISHED, ALINEMENTS PRECISED, ACQUISITION COMMENCED OR CONTINUED AND CONSTRUCTION COMMENCED ON SOME KEY SECTIONS.
SAN BERNARDINO
RAMONA FREEWAY
LEGEND
FREEWAYS
HIGHWAYS
I hereby certify that this map was approved and adopted by the Regional Planning Commission as the Master Plan of Freeways of the County of Los Angeles and of the Los Angeles County Regional Planning District this ... Day of ... 1947
Chief Engineer
Chairman
Attest
Secretary
THE REGIONAL PLANNING COMMISSION
County of Los Angeles
Chief Engineer
Chairman
Attest
Secretary
THE REGIONAL PLANNING COMMISSION
Los Angeles County Regional Planning District
I hereby certify that this map was approved and adopted by the Board of Supervisors of the County of Los Angeles this ... Day of ... 1947 as the Master Plan of Freeways of the County of Los Angeles and of the Los Angeles County Regional Planning District, and it is hereby declared to be established to conserve and promote the public health, safety and general welfare.
J. F. Maroney, County Clerk and ex-officio Clerk of the Board of Supervisors of the County of Los Angeles
By ... Deputy

FIGURE 1

vided. The desire of certain segments of the public for a rail rapid transit system without consideration of the heavy financial elements, however, cannot be accepted as the governing influence when obvious results mean financial losses that would require a program of public subsidy by the taxpayer, whereas the added investment required to develop rapid travel by means of buses on freeways is a fraction of that required for any other type of rapid transit facility.

Forecasts of high density sections by 1970 have been made by the planning commission for the more densely occupied tracts. It may be possible that in such areas as Hollywood, Wilshire, Adams, North East, East, South East and Central, a different type of rapid transit vehicle will some day be required. These statistical areas now contain the following acreage and populations:

Statistical Area	Population 1950	Area Acres	1950 Density	1953 Density	Percent of Metropolitan Area
Adams	401,817	26,712.17	15.04	15.21	3.4
Central	129,578	3,918.80	33.06	30.52	0.5
East	240,291	13,958.93	17.10	16.99	1.8
Hollywood	165,497	16,395.25	10.10	9.70	2.1
North East	162,652	12,088.80	13.50	13.39	1.5
South East	393,791	34,760.42	11.33	11.60	4.4
Wilshire	162,833	7,615.99	21.50	21.40	0.9
	1,656,459	115,450.36			14.6

These seven statistical areas have remained practically stationary or declined since 1950 while all other areas in the metropolitan district have increased in density. Even the planning commission has not been sufficiently optimistic to predict that more than the above 14.6 per cent of the metropolitan area will ever have a density required to justify rail rapid transit.

Bus service on freeways depends largely on density of population. The system of freeways is indicated on the Los Angeles Metropolitan Area Map showing statistical areas, Figure 1.

Coverage of the metropolitan area by motor and trolley coach lines is fairly complete and taken in connection with the substantial number of street car lines provides public transportation in almost any direction of travel. Approximately 82 percent of the passengers

live within two blocks of the line they board. In the Los Angeles area as elsewhere, buses have replaced rail lines almost entirely. In California, San Jose, Stockton, Sacramento, Fresno, San Diego, Bakersfield, Pasadena, Long Beach, Oakland, Berkeley and Alameda buses now serve the traveling public.

Many of the existing bus lines now operate for considerable portions of their routes on state highways. The state highways shown on the map in Figure 1 will ultimately be replaced by freeways as traffic increases demand, and the bus lines now using them can then be transferred to the freeways with consequent improvement in speed and service.

At many points of intersection between freeways and surface lines it is essential that special stop and ingress and egress facilities be constructed to make possible freeway bus operation. These facilities are being provided at the expense of the various jurisdictions at present but will probably be included as a part of the total freeway construction cost pending covering legislation.

The operation of buses on freeways requires first that the freeways be available on which to operate the buses. From the portion of the system already completed and in operation—time required and estimate of funds available by years—it is now possible to estimate probabilities as to availability of the complete express bus freeways.

Since the beginning of the freeway development in 1940 and the construction of the first freeway—Arroyo Seco Parkway—88.9 miles of freeways have been provided for in the several state highway budgets which for the last six fiscal years show the average budgeted mileage per year to be 10.6 miles. Obviously, from the standpoint of immediate and future highway needs of the metropolitan area the freeway program cannot be solved within any reasonable time period on the present ten-mile per year basis. A new approach is needed for the immediate financing and construction of a number of our most important freeways if we are to obtain any relief from the present inadequate traffic conditions. For, in the ultimate, adequate roads don't cost—they pay.

Freeways are being built, they serve several major centers, they provide cross-town travel. It follows that development of freeways for express bus operation is economically feasible in that it provides

service much sooner to a greater portion of the area than could otherwise be realized.

In the Los Angeles Area the operation of buses on freeways is subject to few limitations. The fifty-one-passenger bus proposed with a length of forty feet is equivalent to two automobiles. It can mingle with other motor vehicles on the freeway without undue interference, congestion or delay. And, since almost all of the proposed freeway route lines are presently operating on the surface streets from which they would be moved to the freeways, no appreciable increase in number of units within such areas as the central business district would result from the changeover. Parking turnouts for buses in the downtown section can be directly connected with the freeways, thus supplying off-street parking during layovers.

As to the cost of making the freeways available for express bus operation, on the Hollywood Freeway turnout, loading and unloading facilities have already been provided at Alvarado Street, Vermont Avenue and Western Avenue. The additional cost of these facilities at the locations selected was approximately $200,000 for Alvarado Street and Western Avenue. At Vermont Avenue, however, due to the merging of the Hollywood and Santa Monica Freeways the cost was about $30,000 more than the others. In each of these cases additional right-of-way was necessary as well as lengthening the cross-town bridges over the freeway and providing stairways at the four corners of each bridge for the transfer of passengers between the freeway express lines and the cross-town lines. These costs are materially reduced in the plan suggested by the Los Angeles Metropolitan Traffic Association and illustrated on accompanying reproduction of the plan on page 329.

There are no special license fees for the use of these facilities. They are covered by the 2½ percent of the gross revenue paid by the transit operators for the use of all city streets and freeways. In consideration of all the above factors the conclusion seems quite clear that express bus service on freeways is the logical answer to the automobile-created traffic condition in the foreseeable future.

Parking: Some Retrospective Views

ALLAN H. ROGERS

Mr. Rogers has been Superintendent of Public Works and Village Engineer of Garden City since 1930. He is immediate past-president of the American Public Works Association, and a member of the Institute of Traffic Engineers.

IN ANY phase of life, one should always plan ahead, and this is particularly true of municipal projects. On occasions, however, one should also look back—to see whether the best job was done in the circumstances then existing, to list errors and miscalculations, to appraise progress, and finally to project that much-heralded advance planning. Scoring under any system should show whether you are farther ahead today than when you started.

Garden City is a suburban residential village on Long Island, about twenty miles from New York City. Beginning in 1930, the village became parking-conscious. Various plans for what then appeared a problem were exhaustively explored, largely on a pioneering basis as little had been done elsewhere in this line. In 1936–37 the ingredients jelled, and we were able to formalize the start of a municipal off-street parking program that not only satisfied our basic needs and protected many aspects of our community but set some patterns we gratefully believe have been copied elsewhere.

Our first endeavors were reported in some detail in the April 1947 issue of THE TRAFFIC QUARTERLY. In brief, we acquired seven acres of land abutting the established business district, and within the year following constructed six parking fields with an immediate capacity of 733 cars, an ultimate capacity of about 10 percent more.

Our basic rule was that the cost of acquiring the land was chargeable against the generators of traffic—the abutting business and apartment areas. The village assumed the improvement cost. We believed these parking facilities should improve, not deteriorate, property values. Therefore they were designed and located to prevent, as much as possible, overflow parking on high-value residential streets adjoining the business district, and to screen from these residential

areas the rear of the businesses and the parking facility itself. The treatment, we believed, should be ornamental and park-like, in keeping with a suburban community, spacious to facilitate customer-parking, and coordinated with traffic movement and other local factors. The courts sustained our belief that we should acquire areas for off-street parking in advance of our immediate needs.

The results of our first endeavor were so satisfactory and the continuing need so great that in 1946 we acquired additional land, on the same basis, that would meet our major business parking needs for the next ten years. That land had a potential of 1,228 cars; it has been partly developed and by 1956 our original estimate of full requirement will have been justified.

Beyond these two major sections, there have been some interesting developments, all consistent with our original premise. In one block, the owner of the business frontage gave the village without charge, in lieu of assessment, sufficient rearage for a 64-car field which has since been constructed. In a neighborhood shopping center, we were able to acquire land more economically than through condemnation and so assessed the improvement cost for a 37-car field on practically an equivalent basis.

Most significant of all, the owner of a large tract of presently undeveloped business property deeded to the village, without charge, sufficient abutting land to provide for the future parking of more than 900 cars, so that mutual interests are protected in advance. One other case should be cited: An apartment house was proposed for an unsuitable location that most certainly would have added to parking and traffic problems. With the participation of others interested, the village acquired the property and constructed a parking field for 143 cars, thereon, following the original assessment formula.

Initial Success Guides Future Plans

Where do we stand today? We have thirteen municipal off-street parking fields with a capacity of 1,951 cars, one in the rear of or directly adjacent to every business establishment. Proposed construction during 1954 of two additional parking fields will afford 269 car stalls. We own property that will accommodate an addi-

tional 1320 cars, to be developed as the expansion of business requires. Under consideration is the acquisition of property that will provide some 200 additional spaces.

What did we do wrong? After sixteen years, our stall spaces and drives are still satisfactory. (And from a public works viewpoint, we can still store snow without immediate loading; this should be borne in mind by designers of parking facilities). Landscaping, some twenty feet adjacent to residential property, has been acceptable. Entrances were designed to prevent through-traffic, and this should be studied, but possibly we made them too tight to accommodate all types of trucks. One of the greatest features of the plan to provide parking in the rear of each business establishment has been the matter of servicing: all delivery and collection trucks, instead of using curb space or double parking, are completely indoctrinated to the practice of calling at the rear of the store via the parking field.

It is urged that entrance drives to off-street parking facilities be kept as far as possible from intersections, and that pedestrian walks be provided between parking fields and main thoroughfares to minimize unnecessary driving. Cruisers for parking places will walk a reasonable distance if facilities are provided and if no undue parking restrictions are imposed. Incidentally, our parking fields are operated without charge and without time limit.

The delivery of material and the collection of refuse from the rear of business properties, without traffic interference on a main thoroughfare, is one of the benefits resulting from adjacent off-street parking. And the ability of the storekeeper, under our system of providing off-street parking in the rear of every business establishment, to have an attractive rear entrance and even show windows in the rear of the building has added tremendously to the character of the commercial development; in many cases more shoppers enter the stores from the parking fields than from the main thoroughfare.

Some mention must be made of parking facilities at five railroad stations, where because of private car transportation from other areas some regulation had to be imposed to insure priority parking for our own residents who had paid for the acquisition of the facilities. Our several stations have parking spaces for some 400 cars and for these we issue annual licenses to residents only at a token charge.

These station parking areas have been expanded from time to time, on property owned or acquired, and are believed to be sufficient to meet foreseeable needs.

Any parking plan must have the full support not only of business and residents' interests, but also of planning and zoning authorities. In the early days, there was considerable trepidation about the ability to require new generators of traffic to provide any parking facilities. A cautious approach was made, but now our zoning ordinance has recognized that all new industry, business, and places of public assembly must show adequacy of parking, either existent or proposed, before issuance of a building permit.

What Are the Benefits?

Has our village benefited by our parking plan? The answer, definitely affirmative, must be qualified. There are still some who think that the establishment of parking facilities caters to business to the detriment of the predominantly residential community, and that if such parking be necessary its entire cost should be assumed by business; that the attraction of business by the provision of parking induces more traffic through residential streets, and other problems. This minority does not know that the motor vehicle is here to stay, nor that any community must have a fair balance of all essential contributing ingredients to maintain an equitable taxation; and they would be the first to complain if, when they drove downtown, they could not readily find a parking space. Without question the benefits have been great: many fine stores have been attracted to the business district, parking is always available within reasonable distance, traffic is facilitated by rear-door service, a definite protective barrier has been created between business and residence areas, and the property values of both have been enhanced.

Problems continue, of course, and we still seek the best possible corrective action. During pre-holiday seasons and on the traditional weekly night when stores remain open, parking backs up into the adjacent high-value residence areas. It does not appear to be economic to provide parking facilities for maximum conditions such as these. By the same token, metered parking of our existing fields and

business streets will only tend to drive parkers into the residential areas. In establishing new parking fields, however, in lieu of assessment or to relieve the public share of the cost, metering may be an answer.

We do not feel that we have made any major mistakes. If it were to be done over, we would make no significant changes in location, design or policy. Every car parked off the street, by whatever means, is one less to worry about at the curb and interfering with traffic. That car's terminal location, hourly or daily, is one of the most important factors in the business and municipal economy of any community. While we consider the ability of the single car to find a parking space, let us remember that this is only so because of a broad approach to the problem. Let us not do little things: attack this problem on a broad scale and the results will justify the means.

Highway Speeds vs. Horsepower

ROBERT E. SCHMIDT

Mr. Schmidt is resident traffic engineer of the Eno Foundation, and a research assistant at the Bureau of Highway Traffic, Yale University. He was employed as a district traffic engineer for the Washington State Department of Highways from 1947 to 1949, and was traffic engineer of Tacoma, Washington, from 1949–53.

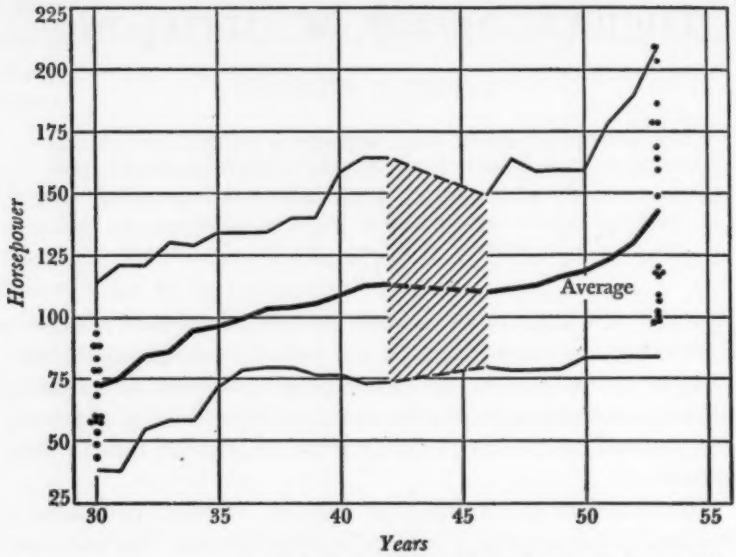
PASSENGER car design in the United States has been noticeably characterized during the last few years by substantial increases in engine horsepower. While certain other developments including automatic transmissions, power steering, and power brakes have also been recently introduced, none of these has created much public controversy.

In the matter of increased horsepower, however, considerable comment has been made. The term "horsepower race" has been used to describe the apparent competition between manufacturers. Some dire predictions have been made that highway speeds will be greatly increased and that traffic accidents will increase both in number and severity.

It is not the purpose of this article to champion the use of either high or low horsepower. Such a discussion would properly entail many automotive engineering factors. This article is a factual report of a limited survey relating horsepower to highway speed as a phase of driver behavior.

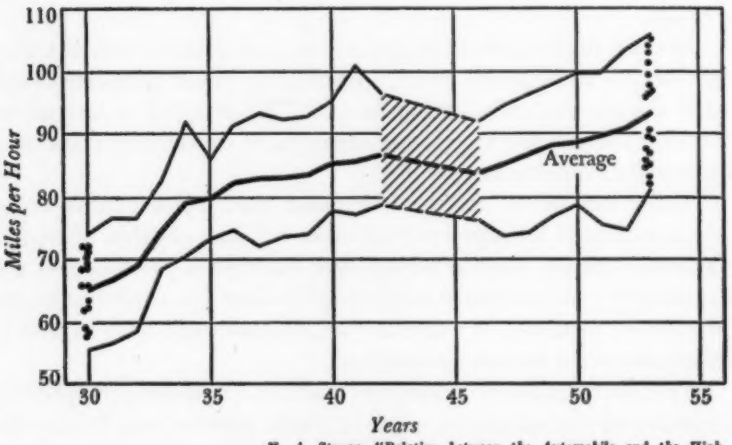
There can be no arguing the point that, other factors being equal, increased horsepower will make vehicles capable of higher maximum speeds. Engine horsepower in vehicles produced in the United States has increased fairly steadily since 1930 and maximum speeds have increased at a similar rate, as shown in Figures 1 and 2. Other important factors are involved.

The investigation on which this report is based was prompted by the idea that the maximum speed of which vehicles may be capable is of less importance than how those vehicles are actually driven under typical highway conditions.



K. A. Stonex, "Relation between the Automobile and the Highway," Highway Research Board, Thirty-Third Annual Meeting, 1954

FIGURE 1. Trend of rated horsepower from 1930 to 1953.



K. A. Stonex, "Relation between the Automobile and the Highway," Highway Research Board, Thirty-Third Annual Meeting, 1954

FIGURE 2. Trend of maximum car speed from 1930 to 1953.

This preliminary investigation was made to provide some guidance in a logical approach to the problem of speed. Casual driving experience and observation clearly indicate that speeding is not confined to high horsepower cars. Speeding, driving too fast for conditions, is dangerous with any car and any car can be driven at a dangerous speed.

Speeds Studied at Two Points

Two locations were chosen on the Wilbur Cross Parkway in Connecticut in the New Haven area. One location, referred to as Location A, was a comparatively level tangent section of a four-lane divided highway with two 24-foot concrete pavements. Shoulders were 8 to 10 feet wide and there was a median divider of varying width. Sight distance is not a factor in controlling speeds on this section of highway.

The second location, referred to as Location B, was a similar stretch of highway approximately two miles west of Location A. The second location, however, was on a long 7 percent upgrade on tangent alignment. Speeds were checked at a point about 2,000 feet up the grade. Only one traffic interchange is located between the two study locations, so that for all intents and purposes the same vehicles passed both locations. Only west-bound traffic, with a volume of about 8,000 passenger vehicles per day, was checked at the two locations. The total sample, consisting of more than 4,000 speed observations, was taken over a period of three days.

Speeds were recorded and also the make, year, and model of the vehicle. Observations were limited to post-war vehicles so that mechanical conditions which might affect the driving speeds of older cars would not be a factor in the study. A radar speed meter was used to check speeds at Location A and the stop-watch method was used at Location B. Only free-flowing vehicles were checked at the two locations.

Analysis of the data involved segregating the speed observations according to the vehicle make, model and year. The horsepower ratings of the different vehicles had been previously obtained. It was therefore possible to re-combine the observations into horsepower

groups. For the purpose of analysis, groups were set up as follows; Group I, under 100 horsepower; Group II, 100 to 130 horsepower; Group III, 130 to 170 horsepower; and Group IV, over 170 horsepower. After grouping the vehicles in this fashion, it was found that Group I included ten different makes or models of vehicles, including a few small foreign-made cars. Group II included sixteen different makes or models; Group III, twelve different makes or models; and Group IV, six different makes or models.

The speed data for each group was then analyzed to determine the maximum speed, the 85 percentile speed, the median speed, the modal speed, and the average speed. The two study locations were analyzed separately.

To check the accuracy of the speed observations, an analysis was made of the combined observations at each of the two locations. The results of this analysis checked almost perfectly with a speed study made by the Connecticut State Highway Department in November, 1953 at a nearby location on the Parkway.

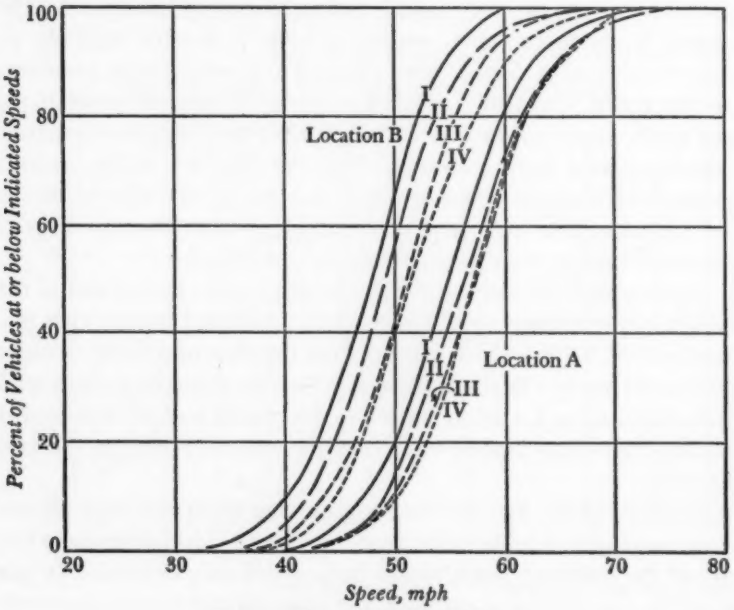


FIGURE 3. Cumulative Speed Curves

Analysis of the data by horsepower groups gave the speed values shown in Table I and the cumulative speed curves shown in Figure 3. The data in Table I shows that at Location A the maximum speed of 76 miles per hour was recorded by a vehicle in the 100 to 130 horsepower group. Only five miles per hour separated the highest speed cars in the four horsepower groups. It is interesting to note also that the group having the lowest maximum speed was Group IV. The 85 percentile speed shows a slightly higher value with increased horsepower as do the median speed and the average speed values. The range, however, between the Group I value and the Group IV value is not great in any case.

The data in Table I for Location B shows that in general the steep upgrade caused a significant drop in most of the speed values. All speed values for Location B are lower than the corresponding values for Location A, with the exception of the maximum speed and the modal speed for the highest horsepower group. This would seem to be one indication that the more powerful vehicles have better hill-climbing abilities, as might be expected.

Table I—Various Speed Values, by Horsepower Groups

		Horsepower Group				
		I Under 100 H.P.	II 100–130 H.P.	III 130–170 H.P.	IV Over 170 H.P.	ALL CARS All H.P.
Location A (level tangent)	Number of Observations	373	1222	410	144	2149
	Max. Speed	73	76	75	71	76
	85% Speed	61.1	63.0	63.2	63.2	62.8
	Ave. Speed	54.9	56.6	57.3	57.3	56.5
	Median Speed	54.9	56.4	57.4	57.2	56.4
	Modal Speed	57.1	57.1	60.0	57.1	57.1
Location B (7% upgrade)	Number of Observations	324	1181	355	87	1947
	Max. Speed	60	71	67	71	71
	85% Speed	53.4	55.1	56.7	58.8	55.4
	Ave. Speed	47.4	49.2	51.0	52.0	49.4
	Median Speed	48.0	49.1	51.1	51.5	49.4
	Modal Speed	50.0	50.0	52.1	57.1	50.0

Factors in Vehicle Speeds

At this point it should be mentioned that horsepower is not the only factor involved in the determination of vehicular speeds. It is true that where speed characteristics or capabilities on level highway sections are to be considered, as in Location A, horsepower is all-important.

Resistance to movement on a level grade consists of rolling resistance and air resistance. Rolling resistance is the lesser of the two, and increases only slightly with increases in speed. Air resistance, however, increases with the square of the speed, and is three to four times as great as rolling resistance at 50 miles per hour. The air resistance is a function of frontal area and speed, and is entirely independent of the weight of the car.

On level grades, where maximum speeds can be approached gradually, the top speed of a vehicle is therefore limited primarily by horsepower. Where hill-climbing ability or acceleration is being considered, however, the weight to horsepower ratio becomes important. The power needed to overcome a 7 percent grade at 50 miles per hour may be twice that required to overcome air resistance at the same speed, and is a direct function of the weight of the vehicle.

This factor was recognized with regard to analysis of the observations at Location B. The weight to horsepower ratios was obtained for 1953 model cars and the values for the original groupings were examined. When this was done, it was found that there was little or no reason to change the grouping of the vehicles.

Table II shows the weight to horsepower ratio, or the pounds per horsepower, for each of the horsepower groups. It is shown that the median values for these four groups decrease as horsepower increases. The table also shows the low and the high value for each of the horsepower groups. While there is some overlapping from one group to the next, a rather consistent relationship is shown to exist.

In considering the data of Table II with regard to the scope and purpose of this study, it was believed that no further consideration need be given the weight to horsepower ratio, and that the results of the study could be evaluated, with no serious error, with respect to horsepower alone.

Table II—Weight to Horsepower Ratio
1953 Vehicles

Group	Pounds per Horsepower		
	Low	Median	High
I	27.4	31.1	34.7
II	25.6	28.6	31.6
III	22.4	23.6	24.7
IV	19.8	22.2	24.6

Analyzing the Speed Data

The speed data for each horsepower group was then analyzed to determine the percentage of vehicles traveling in each five-mile increment of speed. Results of this study are shown in Figure 4 for each of the two study locations. Figure 4(a) for Location A shows that the greatest percentage of vehicles in each group traveled in the range of 50 to 60 miles per hour.

At Location B, shown in Figure 4(b), the greatest percentage of vehicles in each group traveled in a lower range of speed, in this case from 45 to 55 miles per hour. Further study of the figures shows that the lower ranges of speed are more prominent in the low horsepower groups, and that the higher ranges of speeds become more popular as the horsepower increases.

At Location A, for example, we find that approximately 14 percent of the vehicles in Group I were traveling in the 45–50 miles per hour range, while in Group IV only 6 percent of the drivers traveled at this speed. Only 4 percent of the Group I vehicles traveled in the 65–70 miles per hour range, however, while 9 percent of the drivers of the highest powered vehicles preferred to drive at this speed.

This tendency is even more noticeable at Location B. It is seen, for example, that approximately 32 percent of the Group I vehicles were driven at speeds below 45 miles per hour, while only about 12 percent of the Group IV vehicles were driven below this comparatively low speed. Again, less than 10 percent of the low-powered group were driven at speeds over 55 miles per hour, while over 30 percent of the Group IV vehicles were driven above this speed.

It should be noted, however, that at Location A all horsepower

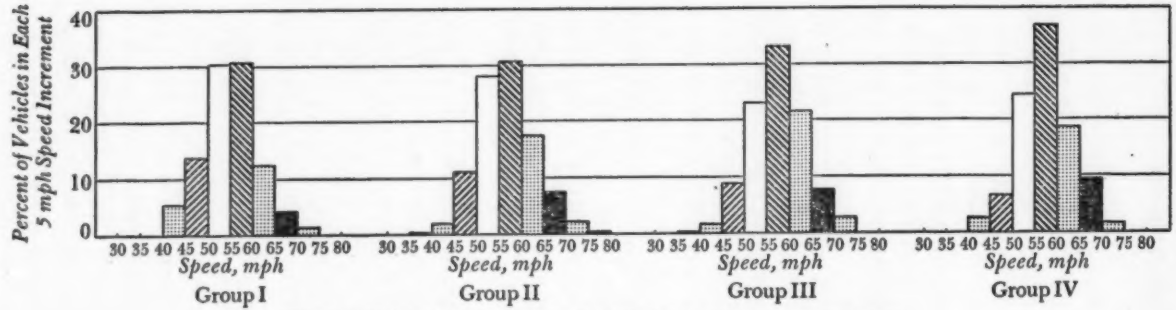


FIGURE 4. (a) Speed Distributions at Location A, by Horsepower Group

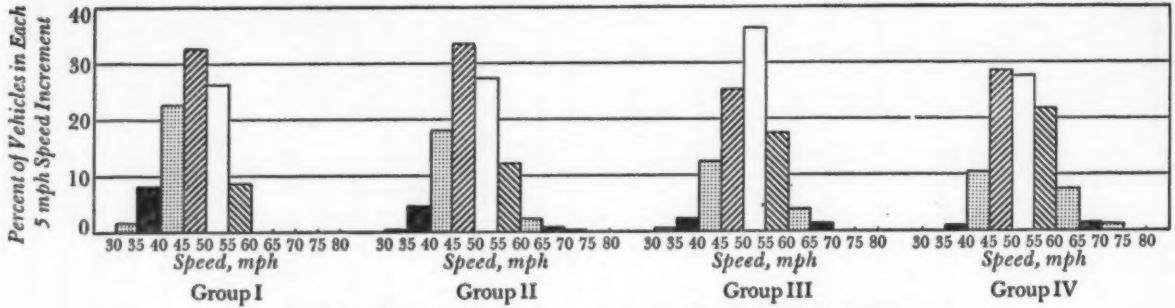


FIGURE 4. (b) Speed Distributions at Location B, by Horsepower Group

groups are fairly well represented throughout the entire speed range. As indicated in Table I, the higher horsepower groups do not exceed the maximum speeds found in the low horsepower groups. At Location B it is evident that the steep grade has limited the top speed of the Group I vehicles.

In order to show these relationships more clearly, the data in Figure 4 has been rearranged and presented in Figure 5. This figure shows, for each 5 MPH increment of speed, the percentage of vehicles in each horsepower group traveling at that speed. By comparing Figure 5(a) and Figure 5(b) the effect of the steep grade at Location B is clearly seen. There are more vehicles in all horsepower groups traveling in the low speed ranges and fewer in the higher speed ranges.

Referring to Figure 5(a) there appears to be a breaking point at about 55 miles per hour. Below this speed we find a greater percentage of low-powered cars than high-powered cars in each speed range. Between 55 and 70 miles per hour we find the percentage of high-powered vehicles is consistently greater than the percentage of low-powered vehicles. Above 70 miles per hour we find a relatively insignificant percentage of all vehicle types. The same general arrangement is noted in Figure 5(b) except that the breaking point appears to be at about 50 miles per hour.

This figure again shows that all horsepower groups are well represented in each speed range from the lowest to the highest speeds, except for Group I at Location B. Perhaps the most significant point brought out by this figure is the fact that while the higher powered vehicles tend to predominate in the higher speed ranges—between 50 and 70 miles per hour—the maximum highway speeds of these higher powered vehicles are not any greater than the maximum speeds driven by the low-powered vehicles.

In interpreting the data of Figures 4 and 5, it should be remembered that the percentages are calculated separately for each horsepower group, and that the percentage figures bear little or no relationship to the actual number of vehicles of each type to be found on the highway. For example, Figure 5(b) for the interval 55–60 miles per hour shows that 22 percent of the Group IV vehicles travel in this speed range, and only 12 percent of the Group II

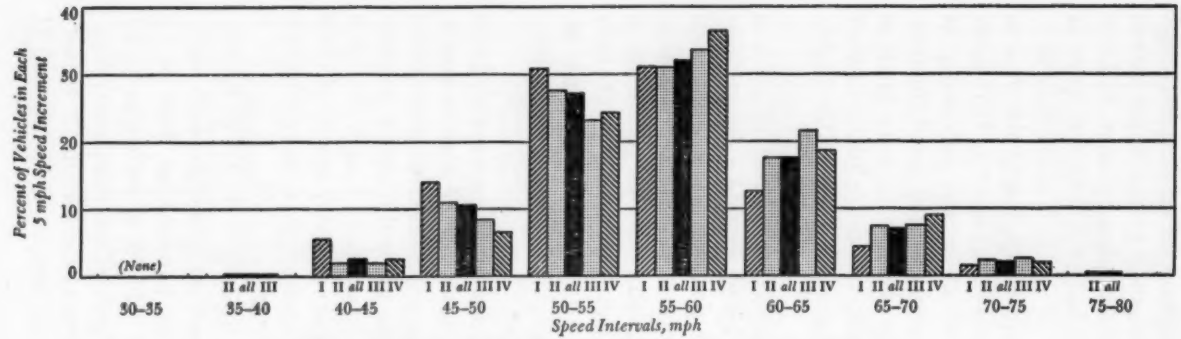


FIGURE 5. (a) Speed Distributions at Location A, by Speed Intervals

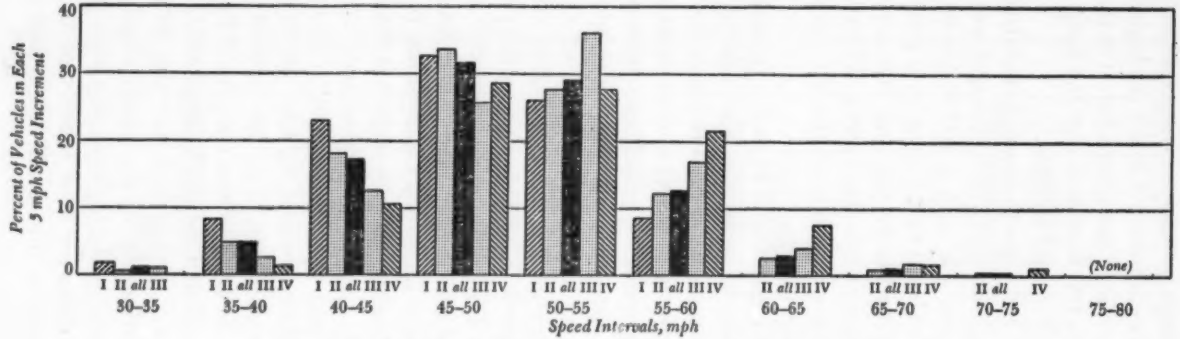


FIGURE 5. (b) Speed Distributions at Location B, by Speed Intervals

vehicles. Actually, because of the fact that Group II contains most of the so-called "popular-priced" automobiles, the 12 percent shown in the figure represents a much larger number of vehicles than the 22 percent of Group IV.

Conclusions of Preliminary Study

Before attempting to draw any conclusions from this study, it must be recognized that the study is preliminary in nature. More studies of this type conducted under varying conditions are needed before any definite conclusions can be reached. The maximum speeds observed on the parkway were undoubtedly influenced to a certain degree by the maximum legal speed of 55 miles per hour. It is entirely possible that studies on "no limit" highways of a high type, perhaps with lower traffic densities, might show somewhat different results.

It should be remembered that the study was basically one of *driver behavior,* and not of *vehicle capabilities.* It is possible that certain factors other than horsepower, such as quietness of operation, comfort, and riding qualities may account in part for some of the speed differentials noted in the study. It would be impossible to evaluate such factors in a study of this type.

Also it must be kept in mind that the study was concerned only with speeds, and not accidents. Any contention that vehicle horsepower has a bearing on accident rates can be resolved only by a study of accident records. It would appear, however, that if speed itself can be considered as having a direct bearing on accident rates, almost any standard production vehicle is capable of attaining dangerous speeds. To attempt to regulate speeds by limiting vehicle horsepower obviously would be unrealistic.

If we can draw any conclusions from this study they might be stated, subject to the limitations discussed above, as follows:

1. The highest powered vehicles, while driven more frequently in the high speed ranges, are not driven at any greater maximum speeds than the lower-powered cars, except perhaps for those under 100 horsepower.
2. As the percentage of higher-powered vehicles on the highway increases, the average speed of traffic may be slightly increased.

3. The high-powered vehicles are better able to maintain desired speeds on steep grades and, because of their lower weight to horsepower ratio, have greater acceleration ability.

4. The vehicles with from 100 to 130 horsepower appear to be driven as fast as any vehicles of any horsepower.

5. Inasmuch as vehicles of 100 to 130 horsepower are generally capable of maximum speeds in the range of 85 to 100 miles per hour it would appear that the critical factor in determining highway speeds is still the driver and not the vehicle.

Organizing the Public for Safety: A Review of Maxwell Halsey's Book

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State Traffic Safety: Its Organization, Administration and Programming. By Maxwell Halsey, Executive Secretary, Michigan State Safety Commission. Saugatuck, Connecticut: Published by the Eno Foundation for Highway Traffic Safety Control. 280 pp.

A SIGN by displayed gravestones of a monument company at Norwalk, Connecticut, advises motorists to "Drive Carefully—We Can Wait." And once along a scenic highway in the Middlewest, clumps of crosses told with legends how many drivers were killed in crashes at those spots.

Citizens had the crosses removed. The tragic reminders, they protested, were ghoulish and unbeautiful. So is a bloody body huddled lifeless in a crumpled car with a child, who somehow escaped, crying beside it, as a news photograph recently depicted.

Yet neither the monument company's clever warning nor the state safety commission's "unbeautiful" reminder does much good. Each is a single incident soon forgotten. To achieve public action, our safety efforts must have *organization, coordination,* and *repetition.* The "Sudden Death" article in *Reader's Digest* vividly described the results of lethally negligent driving. The piece has been often reprinted—but not often enough. And it does not organize legislators, civic leaders, and drivers themselves to participate in a *movement* to decrease motor vehicle accidents.

A speech on safe driving, even a brilliant speech, results in little more than entertainment unless made part of a planned program. I heard one recently. Listeners called it "electrifying." The speaker's sentences were short as stilettos and just as sharp. His thought was clear as carbolic acid. The ballroom smelled of lightning. But it was over, like a storm. His audience sauntered out remarking, "What an

electrifying speaker! What a crackling flow of words"! But to increase our safety, the speaker should have made them say: "What convincing ideas! How necessary for *us* to *take part* in the organized movement he proposed"! The trouble was he didn't propose any.

Organization . . . coordination . . . programming.

Those are the keys to any effective planning and administration of public consciousness for traffic safety. And precisely *how* to organize, coordinate, administer—and carry the programs through—Mr. Halsey explains in this carefully worked out, cogently presented book. His meaty volume directed at state-level safety programs applies specifically with detailed know-how on any level. "State Traffic Safety" constitutes a practicable, usable presentation.

Here are examples of inadvertently harmful situations from a *lack* of coordination:

1. When either police or courts begin stricter enforcement programs without previous explanations, the programs will be resisted not only with lack of public support but with an actual public antagonism. Enforcement always needs explanation and warning.

2. In one state in one month, four different communities conducted four programs on four different safety subjects. Motorists driving through those four cities in one day became both confused and exasperated. What else could administrators expect?

3. Frequently a safety proposal by one group has been publicly attacked by another well-meaning group because the proposal was not explained by a coordinating agency. Consequently the proposal was misunderstood.

4. Police departments overwhelm courts with traffic cases when they put on "drives" without first conferring with the courts. Similarly, some traffic engineering departments suddenly increase the number of signs without first determining whether the enforcement department has the manpower to enforce the increase.

"Coordination" is not telling group leaders how to run their business, Mr. Halsey warns. An organizational structure should contain the agencies whose functions need to be coordinated. Yet agency heads or representatives should feel that they have retained their authority. The coordinating agency should meticulously turn over the leadership of a safety project to the head of the state group having direct responsibilities in that field. The preparation of plans

to facilitate cooperation for department heads on joint projects can be accomplished through meetings and the listing of suggested coordinated action as a basis of discussion.

Under a coordinated approach, a community does not launch an enforcement program. The community launches a combination enforcement *plus* public education-support programs, or an enforcement *plus* court *plus* a public education-support program. This *team-play* will produce more effective results than a non-coordinated program.

The author explains how to coordinate the state departments for traffic-accident prevention; county government departments; city government agencies; associations of governmental agencies as well as associations of non-governmental agencies, and how to coordinate the functional divisions of traffic control. He then explains how to create a state safety organization. He cites typical patterns of state safety organizations that are now functioning efficiently. He explains the relationship of state agencies and departments to the state safety organization. He illustrates the internal organization of a state safety group and its state safety activities. The author discusses the choice of effective programs, their development, and the possibilities for organizing plans to help the accident-prevention curve *catch-up* with the exposure curve.

Mr. Halsey's book includes twenty-nine charts and illustrations. The Appendix of forty-one pages presents such documents as these: The list of affiliates of the Illinois Traffic Safety Council, an Executive Order establishing the Governor's Highway Safety Advisory Committee of Maine, a copy of the law establishing the Michigan State Safety Commission, and illustrative by-laws and constitutions for traffic safety organizations on the state level.

Ways to Select Programs

After you have set up and oiled your machinery for the cooperation and coordination of all groups for traffic safety within your state, you can begin designing programs, the author points out. And the blueprint for programs should itself be cohesive, an overall structure or master-plan for traffic safety. That is the only way for governmental and non-governmental agencies to attack on a united front

against their common problem. Only a uniform assault on a united line will make sense to the public.

Motorists drive from their own "origin to destination." They do not drive with their attention centered upon state, county, or municipal boundaries. Their awareness that each area will confront them with a different program for traffic enforcement confuses and annoys them. Once drivers realize that even an entire state, let alone an entire region, is pulling together on a single safety plan, the public will have greater respect for traffic-law enforcement. That public respect will produce an awareness of our common accident-causes, regardless of the jurisdiction in which the causes arise.

Every community has a local problem. But the problem is local only with respect to streets, highways, and particular intersections. The problem is not at all local in factors that cause accidents. There is strength in unity of plan and in unity of public relations, Mr. Halsey points out. Precisely how far each local government can go in traffic enforcement will depend on how much public support it obtains. It helps everyone concerned when a safety program is so unified that a local law enforcement officer can explain, "This is not merely my idea: all traffic agencies in this state have developed the plan; and every safety organization is sponsoring it."

Experience proves it impracticable to conduct more than six *major* state-wide programs a year. Programs of minor emphasis may be inserted, with careful planning, among the six (or fewer) principal programs. Only limited man-hours and limited funds can be called upon from police, courts, licensing agents, professional safety organizations, and volunteers. It costs money to provide posters, leaflets, stickers, motion picture trailers, radio platters, newspaper mats, and other public educational materials. Resources must be distributed by careful decision.

Many Factors Complicate Selection

Selecting state-wide programs is complex. The author both explains and charts in this detailed volume the principal factors that control the choice. Among them are *timeliness,* the ability to obtain *public support* for effective action, and the degree of ability to attract adequate *financial* and *service* support from non-governmental groups.

The timely logic of attacking drunken driving just before holiday periods will appeal to the public, the police, the courts, and the licensing agencies.

In a program to control dangerous speeds, you can accomplish public relations or public-education publicity that will create support for arrests by police, penalties by courts, and license-suspension. If the emphasis of your program is on motor manners, however, you would diffuse your effect and waste your efforts if you were to stress the need for public support of police enforcement or court action.

Six themes lend themselves particularly to an urging of public support for official action. In May, when increased traffic *begins,* a safety program can emphasize the need to check vehicle maintenance. In June, when summer driving builds up, programs can emphasize speed control. For both campaigns, greater police vigilance and court action can be urged. Officials' cooperation will be sought and announced; public support can be enlisted. In August, the "signs of life"—stop signs, traffic signals, "no-passing" lines—lend themselves in campaign form to the support of traffic engineers, traffic police and courts . . . and to the public support of all three agencies.

A program directed at night-driving hazards will lend itself to appeals for support of headlight enforcement and to support by vehicle and street-lighting groups. In November, a campaign can be directed at the safety of pedestrians. Police can be enlisted to increase the enforcement of pedestrian regulations, and the state automobile club will probably assist in the campaign. A logical December program would direct itself at holiday-driving hazards, emphasizing an enforcement against drunken driving. Cooperation, including financial assistance, should be forthcoming from the owners of bars, from wholesalers of beer and wine, as well as from brewery operators and the state liquor control commission. Mr. Halsey discusses also a campaign for winter-driving hazards in January—and other safety programs for months not mentioned in this review.

Public Support Programs Discussed

You cannot accomplish anything affecting many people unless they understand what you are doing, believe it is right, and have confidence in your capacity and good intention to do the job strictly in

the public interest. The public suspects anything it does not understand. It does not understand conflicting regulations or restrictions unrelated in public thinking to each indivdual's own welfare rather than to the "special interest" of someone else whom many may regard as "bluenoses" or officious cops.

Consequently, Mr. Halsey sets forth, step by step, the ways to obtain public awareness and public understanding—*public support.* He describes the Holiday Hazards Program of the Michigan State Safety Commission. The program's strategy combined public education with enforcement. It attacked the drunken driving problem at its two principal sources—bars and retail liquor stores. And the author explains how much the educational materials cost, how they were used, and what organizations cooperated in the campaign.

Mr. Halsey describes also the public relations techniques for explaining traffic courts, and other accident-prevention aspects of traffic enforcement and coordinated organizational operation. "State Traffic Safety" is a detailed, highly practical, up-to-date manual for organizing, administering, and programming efficient and effective traffic safety work on a state level. Its procedures are applicable, indeed, to any level.

The volume meticulously explains the ways and means of traffic safety coordination and leadership. It presents model laws and resolutions. But it does not stop there. Just as meticulously, Mr. Halsey explains devices for using all forms of communication for making the public *aware* of traffic safety needs and of current moves to supply those needs.

We can draft almost perfect laws. The trouble is that not all persons are virtuous. Not everyone would cooperate with enforcement drives, even if he knew about them beforehand, unless he *understood* how clearly it was to his *own* interest to do so. Likewise, persons already aware of the need for safety movements resent sudden *drives* for safety unless they are previously announced to him and explained.

Abraham Lincoln put the problem this way: "If most of the people are on your side, you can accomplish anything. If public opinion is against you, you can do nothing at all."

Mr. Halsey explains how to *organize,* and how to *persuade.*

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